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ABSTRACT

This curriculum guide presents lessons for computer literacy instruction in the elementary grades. The first section of the guide includes 22 lessons on hardware, covering such topics as how computers work, keyboarding, word processing, and computer peripherals. The 13 lessons in the second section cover social topics related to the computer, including applications of computers, computer ethics, and advantages and disadvantages of computers. The five lessons comprising the third section cover the history and future of computers. The fourth section presents 45 lessons on programming; topics include: BASIC commands, variables, editing, graphics, and commercial software. Performance objectives, vocabulary, motivation, aim, development, application, summary, and exercises are included for each lesson. The guide is intended to be used with a set of task cards. The appendixes include: (1) advice to new computer teachers; (2) advice to experienced computer teachers; (3) guidelines for classroom organization; (4) guidelines for classroom management; (5) guidelines for security; (6) a discussion of computers in special education; (7) software duplication guidelines; (8) instructions for copying diskettes for the Apple IIe and Apple II Plus; (9) instructions for copying diskettes for the IBM/Tandy; (10) guidelines for caring for diskettes; (11) a glossary of computer terms; and (12) a directory of New York City Board of Education Technical Assistance Centers. (MES)

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ELEMENTARY SCHOOL COMPUTER LITERACY

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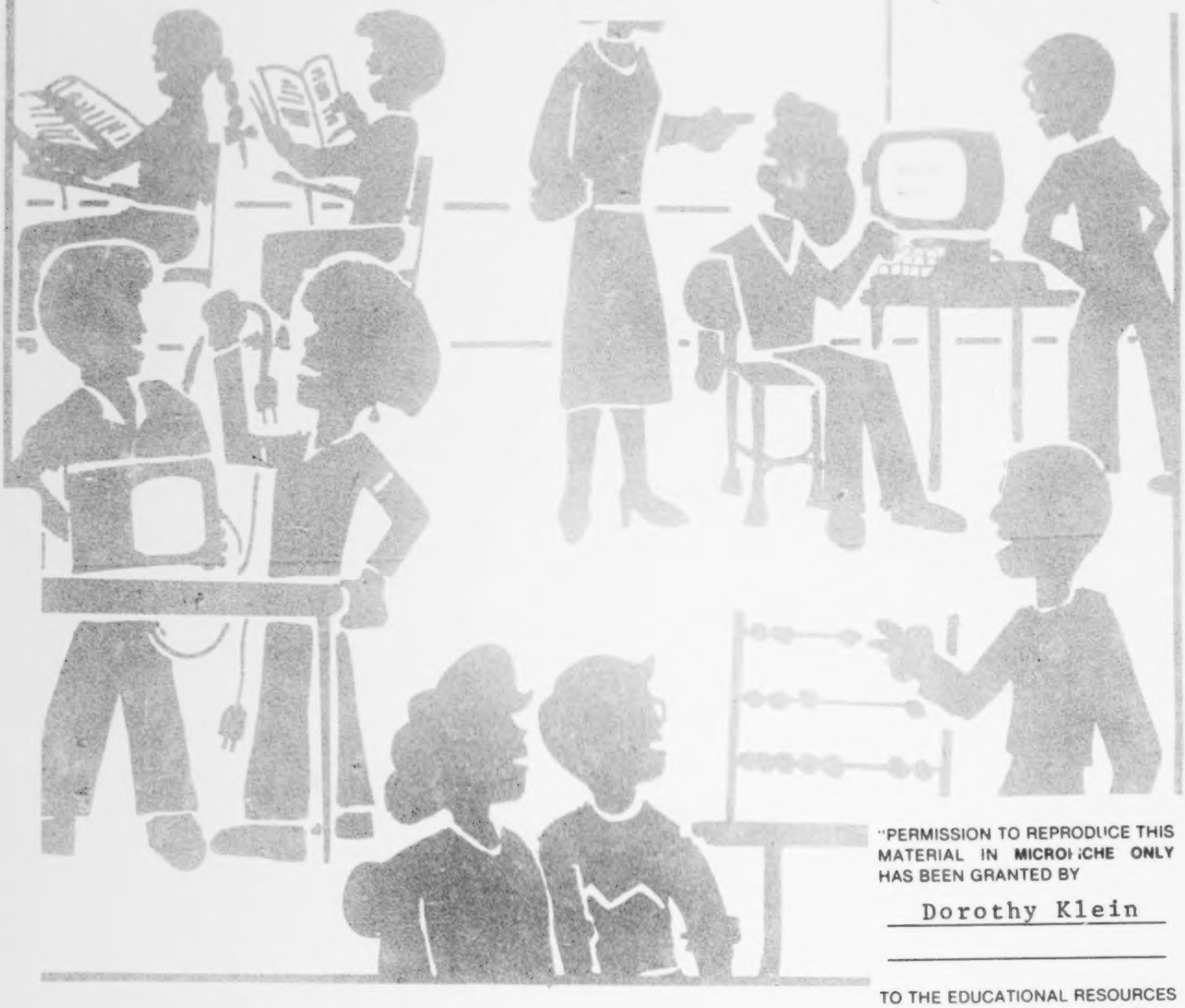

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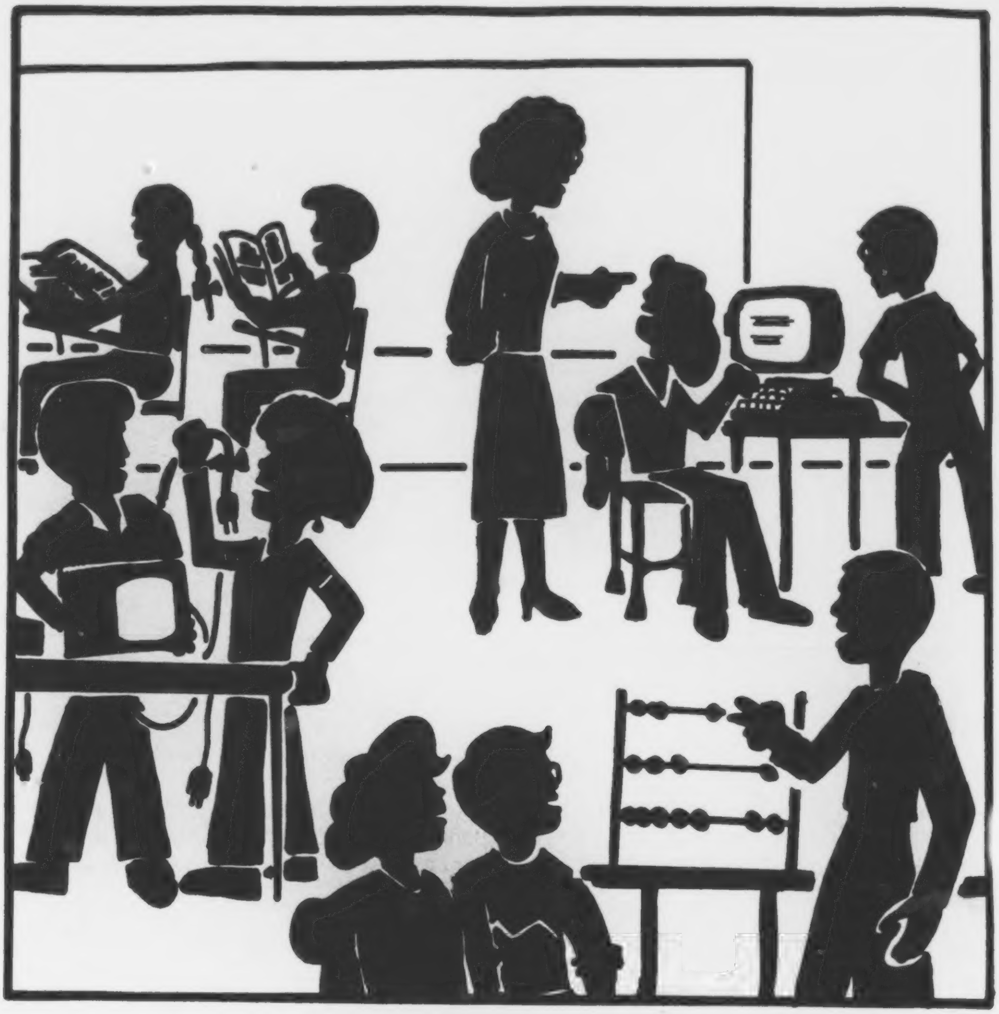

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Introduction

The use of computers in the classroom has become more prevalent during the past few years. Through this use we have developed a knowledge of their functions and a better vision of their potential. We encourage our colleagues to freely experiment and attempt new approaches. Only with all of us working in concert, can we fulfill our vision for an effective integration of school technology into all subject areas. From these beginnings, we will nurture the critical thinking and practical skills our students will need to succeed in the information age. If children are not comfortable with computers, they will be as unprepared for the future as an adult who cannot read or write.

The purpose of this guide is to give teachers and supervisors a working knowledge of various approaches to enhance pupil learning. Our guides are intended to be open ended and flexible in nature. As a 1920 car is not efficient by 1980 standards, outmoded computer education ideas of the seventies have been replaced by the new visions of the eighties. Classroom use of technology has doubled and redoubled in the past few years. Teachers are continually devising new ideas for the use of this technology.

Our primary responsibility in this area and our reason for writing this book, is to see that computers are used as an efficient classroom tool. Only through a real sharing can we move forward in this rapidly changing field of technology. Feel free to write to me directly with your comments and suggestions concerning this curriculum guide, so that we may improve and update it to meet your needs.

Irwin Kaufman

Irwin Kaufman
Director
Office of Technology

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Notes on the Use of This Guide

This book is designed to serve as a resource guide for teachers of elementary school computer literacy and includes material which should accomodate aproximately 270, forty minute periods of elementary school class time. It is intended that this guide be used together with a set of "Task Cards" which are supplied with the book. An earlier book "LOGO K-12", which was produced by the Office of Technology in conjunction with the Division of Curriculum and Instruction, offers a different approach to computer literacy and may be useful as a companion guide.

Each of the topics in this guide represents an approach to the use of computers in elementary grades computer literacy instruction. Each represents a unit of material. Some units may require only twenty minutes of class time to present while others represent a full weeks work. Much is dependent on your individual student's needs. It is expected that teachers will "pick and choose" from among the various methods and approaches which are offered. In that sense, the book is a "sampler" of possible teaching techniques.

Although we do not know all the answers to questions about the new technology, we do have specific goals for implementing computer literacy programs in elementary schools. They are represented by the performance objectives of the topics.

The new technology (including the Basic language) is dynamic and flexible. As a facilitator, the teacher can introduce various topics at the level of the students, choosing to emphasize some aspects of the curriculum according to the needs of the individual classroom.

You and your students may go beyond the limits of this guide. You may find that Topic 6 is appropriate for your first grade class even though it involves some fairly difficult material or that topic 5 is too difficult for your fifth graders.

We encourage you to reach out and share your experiences, ideas, and discoveries. From time to time this guide may be updated with additional materials from you, your students, and many other sources.

This Guide is designed to be used with various implementations of Basic (i.e., Apple, IBM). You might have to make some minor changes as you go through this guide. The minor changes needed to utilize this Guide can be researched in your specific computer reference guides and documentation. There are also commercially sold texts that contain appendices of comparison and conversion tables for the various Basic language implementations.

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Hardware

Task Cards Used in This Unit

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Notes on This Unit

1 - Because of the great variety of possible keyboard designs and the changes made each year as new models are added, this section provides topic plans which represent the principal types of available keyboards.

We support machines with no cursor control (TRS 80), four arrow keys (Commodore Pet) and alternate use of alphabetic characters to implement cursor control (Apple II Plus). All keyboards in general use in our schools fit into one of these classes. Individual lesssons must, of course, be tailored to the specific machines in use in your classroom.

2 - Keyboard templates for some of the other machines, which are popular as we produce this book, can be found in Appendix 13.

TOPIC 1
What is a Computer?

Aim: What Is A Computer?

Performance Objectives: Students will be able to:

- define a computer as a machine used as a tool in calculating and solving problems
- list 7 specific capabilities of a computer
- identify 5 tasks a computer CAN perform
- recognize 5 tasks a computer CANNOT perform

Vocabulary: compute; computer; calculate; user

Materials:

3 common tools familiar to the children (shovel, hammer, saw, for example)
A school computer, or picture of one

Motivation:

Have tools set up in front of you. Hold up one of them and ask the children what it is, where they have seen one, what it is used for.

Example: "What is a shovel used for? What if we didn't have shovels?"

Do this for each of the remaining two tools, one at a time.

*It is important that you establish the fact that these are all TOOLS, and that tools make our work EASIER and get it done FASTER. Tools also help us do a more ACCURATE job.

Development:

1. Bring out the computer and ask the children to identify it - "It's a computer!" "Correct". "But what is a computer? Is it a TOOL like the other objects?"

   Do not accept any answers. Instead, instruct the children to write down their own definition of the word "computer," in one to two sentences. (Make sure students do not refer to dictionaries.) If the children have not yet mastered writing skills, have them verbalize definitions.

2. Have students read their definitions aloud, making them aware of differences amongst their ideas.

   "Why do you think that many of you have different meanings when you all defined the same exact word? How can that be?"

   Encourage responses like - "We don't know enough about computers; we aren't sure about it; some of us know more than others; some have not had any EXPERIENCE with computers."

3. EXPLAIN to the children that there is a need then to learn more about the computer that sits in their classroom.

4. Have the children COMPARE the computer to a tool. Explain that as the shovel, for example, makes digging an easier job for the person using it, a COMPUTER makes COMPUTING much easier by working quickly and efficiently.

5. EXPLAIN that a computer is indeed a powerful tool that can do many things but ONLY with the INSTRUCTION of the person using it (USER).

6. What is a computer? Make a list on the board or on a chart for permanent viewing in the room.

   COMPUTERS HAVE SPECIAL ABILITIES:

   1. Computers do ARITHMETIC (addition, subtraction, multiplication, division)
   2. Computers SAVE INFORMATION (memory)
   3. Computers ORGANIZE INFORMATION
   4. Computers CHOOSE INFORMATION
   5. Computers MOVE WORDS (word processing)
   6. Computers DRAW PICTURES (graphics)
   7. Computers PLAY GAMES

Summary:

Computers are special machines that have special functions to help make work quicker and easier for people.

Follow-up Activities:

1. Have children write an essay: I Think The -------- Is The Most Useful Tool Ever Invented. (children do not necessarily have to write about the computer - whatever they believe is most useful and why).

2. Why do you think people are always looking for "the easy way out" in doing things? Name something you wish was easier for you to do. Think of some ways this might be made easier for you. Explain.

3. Do you think computers have feelings? What similar qualities do humans and computers share? What are some characteristics that are different?

4. Study the phrases. Then decide which column in the chart each phrase belongs to, and write each under the correct heading. (Discuss children's results.)

COMPUTER PROBABLY COULD:	COMPUTER PROBABLY COULD NOT:

a) give you the answers to your next Social Studies test
b) add 514,998 + 998,514 and then divide answer by 45
c) babysit for you
d) put the names of all your classmates in alphabetical order
e) lift furniture (because it is a very powerful machine)
f) help you correct a word you misspelled while using it
g) finish 10 math examples before you do
h) read your mind
i) play tag with you in the park (since it can play games)
j) keep receiving more and more new information without forgetting old information

TOPIC 2
The Effect of Computer Design on Problem Solving

Aim: How Does the Design of a Computer Make It an Excellent Tool for Problem Solving?

Performance Objectives: Student will be able to:

- understand the form in which a computer's information is stored
- understand that a computer is designed with math logic inside
- understand how information is displayed

Vocabulary: New: binary system, ASCII Code, bit, byte, ROM, circuit

Motivation:

Give a child a comb with almost all the teeth missing. Ask the child to comb his or her hair. Now give the child a comb in good condition. Ask the child to comb his or her hair with the second comb. Which was the better comb for doing the needed job? Why? (Relate function and design.)

Development:

1. The design of the two combs in our experiment illustrate how the design of a tool can affect its performance.

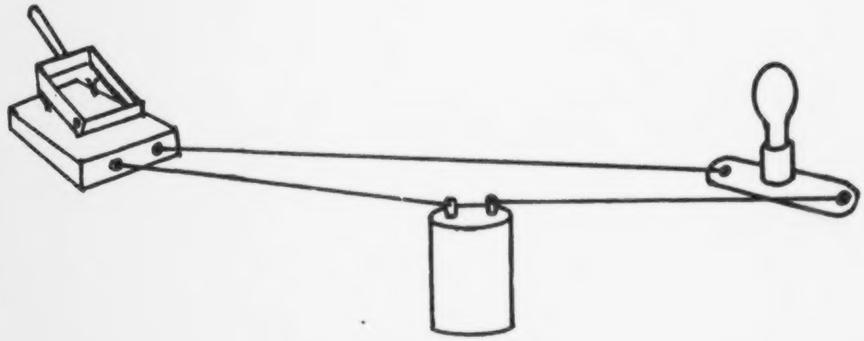
2. We have already learned that the speed and memory capacity of a computer make it very useful in problem solving.

3. We have also learned that all complex operations must be broken down into very simple steps by the programmer.

4. All the computer's information must be stored as numbers. These numbers stand for a pattern of electrical current.

5. Electricity can only be in two forms, off or on.

   Demonstrate with a simple circuit utilizing a switch, three wires, a bell or a bulb in a socket and a dry cell, how electricity is either on or off.



6. Different combinations of the position of the switch will cause the bell to ring or the bulb to light in different patterns.

   Demonstrate appliance : on, off,on, off, on, on, off, on
   on, on, on, off, off, on, off, on etc.

7. Each key on the keyboard is assigned a number based on an electrical pattern.

8. There are only two numbers used: a zero which stands for electricity off and a one which stands for electricity on.

9. A number system that uses only zeros and ones is called a binary system (bi meaning two as in bicycle or bisect).

10. When you press a key the computer changes your keystroke into the coded number for that key. For example, the letter a may have the coded number 65. The computer stores a string of zeros and ones which are the binary equivalent of 65.

11. The ASCII Code is universal. It means American Standard Code for Information Interchange.

12. Make a copy of the following chart and post in the room to demonstrate the different binary combinations.

THE ASCII CODE

A	0100 0001	J	0100 1010	S	0101 0011
B	0100 0010	K	0100 1011	T	0101 0100
C	0100 0011	L	0100 1100	U	0101 0101
D	0100 0100	M	0100 1101	V	0101 0110
E	0100 0101	N	0100 1110	W	0101 0111
F	0100 0110	O	0100 1111	X	0101 1000
G	0100 0111	P	0101 0000	Y	0101 1001
H	0100 1000	Q	0101 0001	Z	0101 1010
I	0100 1001	R	0101 0010		

13. Each zero and each one is called a bit. Eight bits make a byte. A byte equals one keystroke.

14. When you ask the computer to print on the screen or on paper, the computer changes the string of zeros and ones back into the letter and you see it displayed.

15. Since electricity travels very fast and the circuits on chips are very small these changes are instantaneous, hence the speed of computer performance.

16. All of the computer's operations are carried out by special circuits.

17. Since most computers were originally used for calculations, a program for math logic is in the ROM (Read Only Memory) of the computer.

18. Because of what is stored in ROM the programmer does not have to instruct the computer how to add, subtract, multiply or divide. These instructions were given "back in the factory."

19. With this information the computer is a super calculator.

Applications:

1. What is your computer's code for letters and characters? Consult the manual which came with the computer.

2. Make up a riddle and write the answer using the ASCII Binary Code. See if your friends can translate the answer into English.

3. Do the following examples in each of three ways. Have a friend time how long it takes to get the answer each way.

BY HAND	BY HAND CALCULATOR	BY COMPUTER
93-27=	93-27=	PRINT 93-27
84+26=	84+26=	PRINT 84+26
27 x 3=	27x3=	PRINT 27*3
84/6 =	84/6=	PRINT 84/6

Summary:

1. In what form is the computer's information stored?

2. How does a computer display information on the monitor or printer?

3. How does the design of the computer contribute to its speed of operation?

4. How does the computer know how to do math?

Assignments:

1. Create a different number system for a computer to use.

2. What could power a computer other than electricity?

3. What would be the advantages and disadvantages?

4. How did the changes in computer design since 1944 provide for faster performance?

TOPIC 3
Types of Computers

Aim: What Are The Classes Of Computers?

Performance Objectives: The students will be able to:

- describe 3 classes of computers
- explain the relationships between the size of a computer, the size of its memory, and its cost
- define specific prefixes that help identify these classes of computers

Vocabulary: macrocomputer, main frame, minicomputer, microcomputer

Materials:

A picture of a large, medium, and small sized car
(Example: a Cadillac, Buick, and a Volkswagen Rabbit)
Classroom microcomputer

Motivation:

Show the children the pictures of the cars, one at a time. Ask the children to identify each car. Discuss how they are the same and how they are different from each other. Ask the children to suppose they are all grown up and that they enjoy driving to the country on weekends and traveling by car during holidays and other vacations. Ask the children if they had a choice of owning one of these cars, which one would be most suitable for all their packing needs. Which car has the most storage space? Which one has the largest trunk for storage of suitcases, skis, etc.?

The important point to establish here is that "All of these are cars, yet they all have different amounts of storage space."

"There are different classes of computers, too."

Development:

1. Explain that the macrocomputer is the "Cadillac" of computers. (macro=great in size). This is the largest kind of computer and stores the largest amount of information. Also rather large is its cost - thousands, even millions of dollars.

   Also called "mainframes" and are the main computers many smaller computers (like the bank cash machines) are hooked up to.

   Ask children if they can guess the size of the next class of computers in comparison with the macrocomputers, based on its name -minicomputers- "What does the prefix "mini" mean?"

2. Minicomputers - Smaller than macrocomputers; smaller memory, therefore stores less information. Not as quick. Less expensive too. Used in industrial settings.

The next class of computers is called the microcomputers. What does the prefix "micro" mean? What do you think their size will be in comparison to the other two classes?

3. Microcomputer - smallest class of computers; size made possible by integrated circuit chips; least expensive. Being made more powerful every day. Commonly known as the "personal computer". Used in homes and schools.

Show the children the classroom computer. "Why do you think it is also called a personal computer?" "What was especially wonderful about the invention of the microcomputer?" (It was now possible for people to have their own computer, like they would a car, T.V., radio, etc.)

Popular microcomputers: Acorn
Apple II
Atari
Commodore 64
IBM
Radio Shack TRS-80

Summary: There are three different classes of computers. The larger the memory - the larger the computer - the greater the cost.

Follow-Up Activities:

1. You knew that there are different classes of cars, and you know that there are different classes of computers. What else can you think of that is classified? What kinds of characteristics are usually considered when classifying into groups?

2. Which class of computers is the "Cadillac?" Which class of computers is the "Buick?" Which class of computers is the "Volkswagen?" Analyze each word. Then take an educated guess as to the meanings of the words. DO NOT USE A DICTIONARY!!!

   A. macroscopic
   B. miniature
   C. microbe
   D. macroevolution
   E. miniscule
   F. microcopy

NOW that you have finished, you may use a dictionary to check yourself.

3. Read each description to help you fill in the missing prefixes below.

A)	-----computer	Called the "personal computer."
B)	-----computer	Stores greatest amounts of information.
C)	-----computer	Calculates the quickest.
D)	-----computer	Medium-sized computer.
E)	-----computer	Uses integrated circuit chips.

4. Computers seem to decrease in size as computer technology increases. Based on this notion, draw a picture of what you think the most popular computer might look like in the future.

TOPIC 4
The Computing Process (Input-Process-Output)

Aim: How Does A Computer Process Information?

Performance Objectives: The students will be able to:

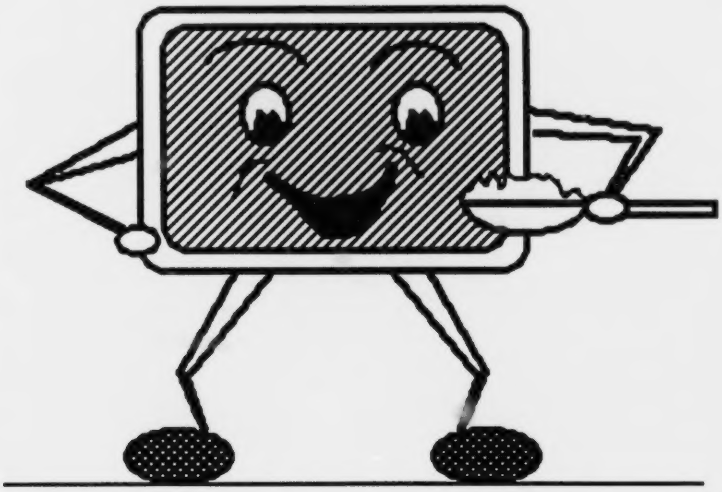
. describe the input-output process
. define the CPU as the "brain" of the computer
. define and identify basic computer hardware and software

Vocabulary: senses, input, output, process, CPU, hardware, software

Materials:

It would be more helpful and interesting for the children if a video game cartridge and/or diskette could be brought in.

Motivation:



Discuss the featured cartoon with the children. "What's going on in this cartoon?" "Is it a funny picture? Is it silly? - Why?"(computers don't have mouths!!) (computers cannot be fed like people can be fed)

"But computers must be fed information somehow. How is this done?"

Development:

1. Ask the children how they take in information every day. (through reading, listening, observing, etc.)

2. What parts of our bodies do we mainly use to take in that information when:

    a) we are READING? (Our EYES)
    b) we are LISTENING? (Our EARS)
    c) we are OBSERVING? (Our EYES)
    d) ETC.

3. Go further into the SENSES. Try to find materials around the classroom that children may be able to touch, smell, or taste.

   "Do you suppose we also take in information by touching something?"

   "What kinds of information might we receive by touching an object?" (that it is soft, fuzzy, hard, rough, etc.)

   "What kinds of information might our nose tell us?" (about smells - musty, flowery, smokey, pleasant, unpleasant, etc.)

   "What kinds of information might our tongue tell us?" (about tastes - sweet, sour, salty, bitter)

   Have children name examples of objects that have the feelings, smells, and tastes they have mentioned.

4. Ask the children "Where does the information we PUT IN go to?" "What part of our body makes the final decision that something has an unpleasant odor, or that something tastes salty?" (Our BRAIN)

   EXPLAIN that the devices we use to PUT IN that information, like the EYES, EARS, FINGERS, NOSE, and TONGUE are called our FIVE SENSES.

   And if we reverse the words PUT IN, we would have INPUT. Our five senses are our INPUT DEVICES.

   We use our input devices to take in information. Then our brain PROCESSES the information. "How do you think we give out or share the information we receive?"

   For example - "Imagine you've just been appointed class president. How would you inform your parents who live with you about this?" (TELL them)
   "Your best friend who lives in California?"(WRITE to him/her)
   "When we PUTOUT information by telling someone, what devices do we use?" (mouth) "When we write?" (hands, pen, paper)

   These are called OUTPUT DEVICES.

5. EXPLAIN that computers take in, process, and put out information in a very similar way that we do.

Make a chart:

In Humans:

Input - brain RECEIVES information

Process - brain USES information

Output - the RESULT PRODUCED by brain

6. How does one put information into the computer? (Input)

HARDWARE - physical parts of the computer - parts you can touch. The Input Devices are the Hardware.

Examples: keyboard, disk drive

SOFTWARE - the information (called a PROGRAM) put into the computer; the instructions.

Examples: video game cassette, diskette

7. After information is put into the computer, just as in humans, a computer "brain" processes the information. This is called the CPU (Central Processing Unit).

In the CPU - arithmetic, logic, decision-making, rearranging operations are performed.

8. Information is put out (Output) on various pieces of hardware: screens, printers, video display units, monitors, CRT (cathode ray tube).

9. Make chart of computer input-process-output system.

COMPUTER: Input - CPU receives information

Process - CPU uses information

Output - Results produced by the CPU

10. Complete the lesson by comparing the human input-process-output system to the computer's.

Summary:

The computing process consists of 3 main parts: input-process-output.

Follow-up Activities:

1. READ the situation below and then EXPLAIN the chart.

"Your teacher assigns a book report to the class."

YOU READ A BOOK ----> YOU DECIDE WHAT TO WRITE ABOUT ---->
YOU WRITE REPORT ----> YOUR REPORT IS COMPLETED ----> YOU HAND IT IN TO
THE TEACHER

2. IDENTIFY each as either INPUT, PROCESS, or OUTPUT. Also, underline the word or words that help you get your answer.

   (*letter h has two possible answers).

   a. You cry after reading your report card.
   b. You wave to your friend after spotting him across the street.
   c. You're deciding whether to have chocolate cake or ice cream for dessert.
   d. You're listening to your stereo.
   e. Your teacher gives back a marked test paper.
   f. You're figuring out a mathematical word problem.
   g. You let out a scream at a scene of a horror film.
   h. You're playing the flute.
   i. You're trying to choose between flowers or candy as a gift for someone special.
   j. You're waiting at the corner and you notice the traffic light turns green.

3. Rewrite the following in the correct sequence (order):

   The CPU carries out the student's instructions.

   A student punches in various letters on a computer keyboard.

   "My name is Bobby" appears on the screen.

TOPIC 5
Peripheral Input and Output Devices

Aim: What Are The Peripheral Input And Output Devices Computers Use?

Performance Objectives: The students will be able to:

- define the term "peripheral"
- recognize and describe types of peripheral hardware
- identify and describe software used with peripheral computer equipment

Vocabulary: peripheral; external; cassette; floppy disk; disk drive; hard disk unit; cartridge; card reader; optical mark reader; printout; plot; plotter

Materials:

Any of the hardware or software discussed in this lesson would be helpful.

Motivation:

Review with the children that one of the ways we receive or input information is with our "eyes." Direct the children to focus their eyes at the chalkboard, keeping their heads perfectly straight. Tell them to continue staring in front of them while they listen to your questions.

"Can you see anything in the classroom besides the chalkboard, desks, and people in front of you?"

"What can you see?" "WHY can you see those things when you're not even looking at them?"

Reach the conclusion that our eyes have special ability to see objects in the "outermost part" of our field of vision. Explain that we all have "PERIPHERAL VISION."

We are always using our peripheral vision. "Can you think of a time when we are not?" "Can you imagine not having it?" (Have students cover up their peripheral vision with their hands). "What problems would we have walking, driving, crossing the street?"

EMPHASIZE THIS:

Just as we depend on our peripheral vision to help us take in information around us, the computer depends on its own peripheral equipment to help TAKE IN information, and PUT OUT information as well.

Development:

1. How is information put into the computer? Children should be able to recall "keyboard" from input-process-output lesson.

Is a keyboard part of our classroom computer? (If it is, then it is not a peripheral input device. If it is not attached to the terminal, then it is a peripheral device.)

2. Some input devices are not connected to the computer. They are EXTERNAL to the computer. Such devices include:

   A. Cassette Tape Recorder - Ask children if they have ever used one. How have you used it as an input device? Explain that the recorder uses a cassette tape (software) on which a program has been stored.

   B. Disk Drive - Similar to a cassette recorder, a disk drive reads instructions of a program on a floppy magnetic diskette, or disk (software) for short. The disk is fed into the disk drive, which, depending on the model and make of the computer, may or may not be connected to the machine.

   C. Hard Disk Units - May be part of the microcomputer. These are used for reading programs found on a cartridge, like a game cartridge.

   D. Card Reader - This input device reads punched cards (software) with punched out instructions on them.

   E. Optical Mark Reader - This device reads marked sheets of paper and transfers that information into the computer. The answer sheets you heavily mark with your No. 2 pencils for special tests are marked in this way with this device.

3. How does this information get put out on the following peripheral output devices?

   A. Video Screen - Most common. May or may not be attached to the computer. Your own television set may be used as the screen for some home computer keyboards.

   B. Printer - Information may be printed on paper. The final printed output is called a printout. People use printouts when they need to read their data when they are not seated at the computer.

   D. Plotter - Unlike the printer, a plotter plots (marks) graphs and pictures. It is useful to people who plan out and map their work in this way, like architects and engineers.

E. & F. Cassette Recorders & Disk Drives - Once again!! Yes, these put out information through tapes and disks as well as put in.

Summary: Input and/or output devices may be connected to a computer for different purposes.

Follow-up Activities:

1. People use various external peripheral devices for different reasons, just as computers do. Look at each item in the list below. Then explain how each might be used as an INPUT or OUTPUT device in helping people GET or GIVE information.

   a. encyclopedia
   b. maps
   c. globe
   d. dictionary
   e. shopping list
   f. record album
   g. camera
   h. photograph
   i. a chart
   j. a painting
   k. a diary

2. Which peripheral device would most likely be used to:

   a. grade a city-wide reading test?
   b. plan out the design of an upcoming shopping center in your neighborhood?
   c. play MARTIAN INVASION with your best friend?
   d. read the names of students in Class XYZ from a disk?
   e. print a customer's monthly telephone bill?

TOPIC 6
Parts of the Computer (RAM and ROM)

Aim: What Are The Two Kinds Of Computer Memory?

Performance Objectives: Students will be able to:

- identify the memory as the part of the computer that stores and remembers data in the CPU
- describe and compare the two different kinds of computer memories

Vocabulary: permanent, temporary, RAM, ROM, CPU, acronym

Materials:

10 various common everyday objects, such as: lipstick, paper clip, pin, nail file, matchbook, band aid, key, penny, stamp, scissors.

Motivation:

Set the 10 objects on a desk in a scattered manner, putting them neither too close to nor too far from each other.

Cover all the objects with a large enough paper.

At this point the children would not have seen any of the objects. Call up a row or table at a time to come to the desk and stare at the objects for one minute. They can do nothing else but closely observe the objects and try to remember what they are looking at.

After each row sits down, they are to go back to their seats and start writing down what they saw on the desk. After most children have written down all they could remember seeing, have them call out the items they remembered.

See who remembered the most objects. "Which objects were easiest to recall? Which were most difficult? Why?"

Go even further into the discussion - ask for specific details.
"What color was the lipstick?" "What brand was the band aid?" "What year was featured on the penny?" "Was it a shiny penny?"

"While you were studying the objects, where were you storing the information you were taking in? How did you remember the items on the desk?"

"What does it mean to have a good memory? a poor memory?"
"What are the advantages of a so-called good memory?"
"What are the disadvantages of a so-called poor memory?"

"Do you think the computer's memory is similar to a person's?"

Development:

1. EXPLAIN that the computer stores information in the storage unit of the CPU - the MEMORY.

2. Ask the children what are some kinds of information they will most likely remember all their life. (Their birthday, name, age, members of their family, where they live, phone number, etc.)
These types of information they will remember PERMANENTLY.

3. What are some kinds of information you remember just for the moment - just for the time the information is needed for - just TEMPORARILY? (a recipe, what you wore yesterday, your lines in a school play, etc.)

4. Just as we store information permanently or temporarily, so does a computer.

   The computer's TEMPORARY MEMORY is known as RAM, which is an ACRONYM for Random Access Memory. With the RAM, information YOU type, or load into the computer is stored and remains there as long as the computer IS NOT SHUT OFF. You can make changes in the program that gets stored in RAM, but in the end, the information will be lost unless something specific is done to save it.

5. The PERMANENT MEMORY is called ROM, another acronym which stands for Read Only Memory. The ROM stores special instructions that the manufacturer built into the computer. Therefore, YOU, the USER, CANNOT change this information.

6. EXPLAIN that both kinds of memories are necessary for the computer to function properly. "Why do you think this is true?"

7. DISCUSS - "What are the important differences between RAM and ROM?"

Summary:

The computer has two kinds of memory - RAM (temporary storage) and ROM (permanent).

Follow-up Activities:

1. Tell which kind of computer memory is being used by writing RAM or ROM next to each correctly.

   a. You're making changes in a program you've been typing all morning.
   b. You purchase a home computer and discover it already has some special instructions programmed into it.
   c. You printed "I AM FINISHED" on a screen, shut the computer off, and walked away.

2. List 5 types of information you think you will remember permanently in your life, and 5 that you think you will remember just temporarily, for the time being. Next to each one, very simply explain why you believe you will remember that specific information either on a permanent or temporary basis.

3. RAM and ROM are both ACRONYMS, words formed from initials of separate terms. Below are familiar acronyms in our society.

Match them correctly to their separated terms on the right hand column.

1. UNICEF
2. RIF
3. SALT
4. ASPCA
5. MOMA
6. FICA
7. ERA
8. NASA
9. MADD
10. BAM

a. Equal Rights Amendment
b. United Nations International Children's Emergency Fund
c. American Society for the Prevention of Cruelty to Animals
d. Federal Insurance Compensation Act
e. Strategic Arms Limitations Talks
f. Brooklyn Academy of Music
g. Mothers Against Drunk Driving
h. Reading Is Fundamental
i. Museum Of Modern Art
j. National Aeronautics and Space Administration

TOPIC 7
The CPU

Aim: How Does The CPU Work?

Performance Objectives: The students will be able to:

- identify the two units of the CPU
- describe the CPU as a computer chip
- explain the computer binary system

Vocabulary: logic; microprocessor, binary, bit, byte

Motivation:

Tell the children you are going to put two examples on the board. Tell them to choose to do one of the examples on note paper.

```
A.  216          B.  216
   X 8               216
                     216
                     216
                     216
                     216
                     216
                   + 216
```

How many of you chose to perform example "a?"
How many did example "b?"
Why did most of you prefer to do "a?"
("A" is shorter and quicker to do)
"What are the answers to these problems? Why are the same answers?"
(Multiplication and repeated addition are the same.)

"Imagine doing an example like this by repeated addition:"

```
 962
X 45
```

"Could you imagine adding 962 to itself forty-five times?!"

"How long do you think it would take you? Is there anyone who wants to attempt it while we time you?"

"Which method do you think the computer uses when performing multiplication - the "a" or "b" method?"

Believe it or not, the computer uses the repeat addition when doing even the most complicated multiplication - and it will do it in LESS THAN A MILLIONTH OF A SECOND!!!!!

Where does the computer do this? In the CPU.

Development:

1. EXPLAIN that all the mathematical operations are performed in the ARITHMETIC/LOGIC UNIT of the CPU.

   Besides doing arithmetic, the computer also COMPARES the values of numbers, a very "logical" job. In order to be able to do this, the computer must be specially programmed.

2. The CPU has another part. It's called the CONTROL UNIT.

   This unit controls the flow of the information that is put into the computer.

3. Just as the heart controls the flow of blood, sending it to the various organs in our body, the control unit sends information to the various parts of the computer.

   From an input device, information is taken by the Control Unit and sent to the memory for storage. It can also receive the information from the memory. See below.

   Input device-------> Control Unit-------> Memory

   or

   Input device------> Control Unit <-------Memory

4. The Control Unit sends the information to or from the arithmetic logic unit to be calculated or compared:

   Input device------> Control Unit-------> Arithmetic Logic Unit

   or

   Input device------> Control Unit <-------Arithmetic Logic Unit

5. It then sends the information to be seen on an output device, a screen, for example.

6. Just as our body needs our heart to pump the blood, sending it to our vital organs, the computer needs the Control Unit to direct the flow of information. Otherwise, information would be "clotted" in the computer.

7. What does the CPU look like?

   The CPU is an INTEGRATED CIRCUIT CHIP.

8. In the microcomputer (personal computer), the CPU is one little chip appropriately called the MICROPROCESSOR.

9. How does this chip work?

Electricity either flows through the circuit or it does not. When it DOES FLOW, the circuit is ON; when it DOES NOT FLOW, the circuit is OFF.

10. The digit "1" identifies an ON circuit; the digit "0" identifies an OFF circuit.

This is known as the BINARY NUMBER SYSTEM. "BI" meaning "two", 0 and 1 being the numbers.

11. The 0 and 1 are called "BITS" ("b" from binary; "it" from last two letters in "digit.")

12. Whenever the CPU reads an instruction put into the computer, it translates it into a group of 0's and 1's (bits).

The group of 0's and 1's is called a BYTE.

FOR EXAMPLE: The instruction might be to PRINT "Hello"

Each letter in the instruction would be represented by a BYTE.

P 10100011

R 10100101

I 01001010

N 00001110

T 01101001

H 11000011

E 00001001

L 10000011

L 10000011

O 00111110

Is each different letter symbolized by a different byte?

Which letter is represented by the byte 11000011?

How many bits (digits) make up each byte?

Which letters have more circuits ON than off? Which letters have more circuits OFF than on?

13. Most computers can store up to 64,000 bytes of information in the RAM. That is the typical memory size. 64,000 bytes may be written like this: 64K (k means kilo; thousand), so 64K = 64,000.

Summary:

The CPU has two parts: the Arithmetic Logic Unit and the Control Unit.

Follow-up Activities:

1. Which unit of the CPU would do the following? Write the name of the unit correctly next to each:

   a. Multiply 738 x 61.

   b. Send a program from the keyboard to be stored in the memory.

   c. Total up the number of students who were absent from school last Friday.

   d. Send the message "YOU ARE SO SMART" to the monitor.

   e. Take information that was stored in the memory to be processed.

2. THOUGHT QUESTION: How is the control unit of the CPU like the heart? Why is the heart of vital importance to the body? Why is the control unit of vital importance to the computer?

3. A computer is instructed to print the word found below. The CPU is reading it carefully. You do the same and then answer the questions.

T	01001111
E	11100000
R	10000010
R	10000010
I	00010110
F	01010101
I	00010110
C	11011011

   a. Which letter is represented by the most ON circuits?
   b. Which letter is represented by the most OFF circuits?
   c. What is the byte shown here for the letter "E?"
   d. What is the letter symbolized by the byte 01010101?
   e. How many bits equals one byte?

TOPIC 8
Introduction to the Keyboard

Aim: What Do We Find On A Computer Keyboard?

Performance Objectives: Students will be able to:

- recognize the placement of letters on the keyboard
- recognize the placement of numbers on the keyboard
- recognize the placement of symbols on the keyboard
- recognize and know the use of special keys on the keyboard
- be able to tell the difference between a typewriter and computer keyboard

Vocabulary: key, keyboard, keyboarding, shift, return, control key, reset key,

Motivation:

Project a large blank keyboard using an overhead projector or display a large blank keyboard chart.

Ask the class "Where have you seen something that is similar to this outline?"

Development:

1. Distribute a duplicated copy of the keyboard of the computer that the students will be using. The teacher should project an overhead transparency or have a very large copy of this keyboard fastened to the board.

   a. Have the students point to each letter of the alphabet. Tell the students that each letter is printed on a "key" and that what they are looking at is called a "keyboard".

      Point out that this is one of many different keyboards that are used on typewriters and computers.

   (1). The teacher should ask "How are words made from this keyboard?"

   (2). Ask "How are sentences made using this keyboard?"

   b. Show the children the space bar. Explain that this is how we put a space between words so that we can make sentences.

   c. Tell the students that when you press the keys to enter words or numbers into a computer, we call this process keyboarding. This word replaces the word typewriting because we now do the same process on many machines other than typewriters.

   d. Ask the children to find the special punctuation marks that are involved in the construction of a sentence (, . ? ! : ;).

e. Have the students find the numerals 1 - 0. Point out to them that there are special characters also printed on the keys.

f. Ask the students to identify each symbol and tell its use. Make a list on the board showing the symbol and its use.

g. Depending upon the computer you are using tell the students about the special keys on the computer and their special uses.

(1). Shift key - changes from capital letters to small letters

(2). Return key - tells the computer to take what you have typed and put it into its memory.

(3). Arrow keys - allows you to move around the screen.

(4). Other keys should be taught later on as the need arises.

2. Some activities that could be used for drill and reinforcement include the following.

   a. Children can draw or collect pictures to paste on the large copy of the keyboard. This would then be used as a bulletin board.

   b. Play Keyboard Bingo - The teacher distributes blank bingo cards to the student. The student then fills in any 24 letters or symbols (the middle box was pre-printed "free".) The teacher points to a key on the large picture of the blank keyboard and the children who have that symbol put a large X in the box. The one who has five in a row (including the free box) wins.

   c. Word Spell - Prepare in advance words on index cards and place them in a box. The student picks a word out of the box and has to point to the letters on the keyboard.

   d. Play Computer Sounds - The teacher points to the blank keyboard and calls on a student. The student must make the sound of an object represented by the blank space that was pointed to.

   e. Have the children color in the letters that correspond to their name. Different colors could be used for each name.

   f. Have the students cut out and build their own computer model. See worksheet that follows.

Final Summary:

1. What is a keyboard?
2. How many letters are there on the keyboard?
3. How many numbers are there on the keyboard?
4. What do we mean by keyboarding?
5. List the special keys on your keyboard and tell the use of each.

Applications:

1. Count out a hundred words in a story book and see which letters are used most often.
2. List the symbols on your keyboard, and tell what each symbol might be used for.

Projects:

1. Write a report about other types of keyboards such as the Dvorak keyboard.
2. Build a model of a computer showing the keyboard you were taught.

WORKSHEET #1-KNOW YOUR KEYBOARD

Below you will see 25 boxes. Place one of these letters, numbers or symbols in each box. Do not put anything in the box marked FREE.

When your teacher points to one of the keys on the chart of the keyboard, see if you put this symbol on your sheet. If you did, then write a big X in the box with that symbol.

When you have five in a row raise your hand. The row can go across the page, up and down, or from corner to corner.

		FREE		

TOPIC 9
Computer Keyboard Etiquette - Do's and Don'ts

Aim: What Is The Appropriate Behavior When Using A Computer?

Performance Objectives: Students should be able to:

- identify inappropriate behavior when working with microcomputers
- identify acceptable practices when using microcomputers

Vocabulary: volatile, local area network, interfaces

Motivation:

Initiate lesson via a discussion of good manners in general, at home, at school, at a sporting event or at play.

Discuss that each situation has its own definition as to what is acceptable and unacceptable. Have students realize that when working with computers certain behavior is unacceptable.

Development:

1. Why should the computer's keyboard be treated with care?

The keyboard is the place where the person meets the computer. The keyboard is the primary input device on most computers and as such it is expected to get a great deal of use. However, since the keyboard is so important to the computer's operation, the keyboard must not be abused. Long term abuse will result in damage and that means interruption in use and costly repair bills.

When keying in programs or data it is wise to remember that under each key is an electrical contact - the more use it gets the sooner it will wear out. Therefore, it makes little sense to depress keys over and over just to see the letters displayed on the screen or to try to challenge the computer by pressing down many keys at the same time. Both practices are clearly not appropriate, cause undue wear and tear and are clear signals that the user is not ready to operate a computer. Remember you can have fun with computers, but playing with the keyboard is not the way.

Computer keyboards are sophisticated electrical input units which are very sensitive to the touch. When depressing a key a light touch is usually more than enough to effect the contact. Applying too much pressure or pounding the keyboard in any way is unnecessary and can cause damage.

Since keyboards work by making electrical contact, care should be taken that nothing interferes with these contacts. Food crumbs and spilled drinks could very well interfere with the electrical contacts, therefore no food or drink should be permitted near the computers.

2. Can the special function keys be used at any time?

The special function keys are just that, for special functions such as: loading programs, entering data into the computer's memory, clearing the screen, or breaking into a running program. Depressing these keys for any other purpose causes wear and tear and might result in erasing the memory.

3. Can the computer be moved around to make it easier for me to use?

Although microcomputers are compact and lightweight, most are not portable. Once set up they really should not be moved around, pushed or pulled. The computer may be part of a "local area network" (computers connected together for transmitting and receiving data) and movement may disconnect interfaces (connections), disrupt the electrical source and wipe out the memory or worst of all fall off the table or desk. Simply stated, move yourself around, not the computer.

4. Why should computer users be careful with the memory?

It is important to remember that the computer's memory is volatile - it can be erased easily and all that was stored there cannot be retrieved. A computer user must be careful not to turn off the computer, interrupt the electrical source or type in "NEW" until you have asked the previous user if he has saved what's in the memory on an outside memory source (disk or tape).

Activities:

1. Ask student to make classroom signs to encourage acceptable behavior around computers.

2. Have students write an essay entitled "How To Prevent Computer Breakdowns".

3. Assign student to construct a bulletin board on the theme "Computer Do's and Don'ts".

4. Develop a users guidebook entitled, "The A B C 's of Using the Classroom Computer" for example,

   A - Always ask before turning off the computer.
   B - Banging the keyboard is not allowed.
   C - Care is a must when using the computer.

TOPIC 10
Practice Keyboard Skills on the Apple
A 'Generic' Lesson. See Notes on Page 2

Aim: How Do We Use The Special Control Keys On The Apple Keyboard?

Performance Objectives: Students will be able to:

- use the alphabet and number keys
- use selected special function keys
- demonstrate how to move the cursor around the screen

Vocabulary: cursor, space bar, delete, home, scrolls, functions

Motivation:

Show a typewriter and a computer. Ask "How are these two machines similar? different?

Development:

1. Note that computers and typewriters both have keyboards, but the computer has special keys to do special jobs or functions. Both have a specially-shaped key called a space bar. Ask "What happens when we press the space bar?" (rectangle of light moves forward one space)

2. State that this rectangle of light is called a cursor. Ask "what does this cursor show you?" Point out that the word comes from the Latin word meaning "runner". Press space bar several times.

3. Recall that the computer can do more than a typewriter. Find the key marked ---->. We call this the cursor right arrow key. Press it once. What happened? (The cursor moved to the right.)

4. Find the key marked <----. We call this the left arrow key. Press this key and the SHIFT Key. What happened? The cursor moved backward one space.

5. Type your name. Press the <---- key one time and press the space bar. What happened?

6. Type HOME and press return. What happened? (Cursor moved to the top and the screen disappeared. You told the computer to erase the screen.)

FUNCTION KEY CHART

KEY	FUNCTION (JOB) PERFORMED
Space - bar	Moves cursor ahead one space.
----> Right Arrow key	Moves cursor ahead.
<---- Left Arrow key	Moves the cursor back one space.
HOME	Returns Cursor to top of screen and erases what is on the screen.

7. Type your name. Look at the keyboard and find the ESC key. Press ESC and then press the "M" key. What happened? The cursor moved down a line.

8. Press the ESC key and then press the "I" key. What happened? The cursor moved up one line.

9. Press the ESC key and then press the "J" key. What happened? The cursor moved left one space.

10. Press the ESC key and then press the "K" key. What happened? The cursor moved right one line.

11. Type your name. Press the return key 24 times. What happened? Note that the screen has only 24 lines and that as you add more lines the top line scrolls (moves upward) and off the screen.

FUNCTION KEY CHART

KEY	FUNCTION (JOB) PERFORMED
ESC + I	Cursor moves up one line.
ESC + M	Cursor moves down one line.
ESC + J	Cursor moves left one space.
ESC + L	Cursor moves right one space.

Summary:

1. How are computer keyboards similar to typewriter keyboards?

2. How are computer keyboards different from typewriter keyboards?

3. What is the purpose of each special function key?

4. What do we call the blinking light? What is its function?

Applications:

1. Practice using the cursor keys to correct, add to or subtract from, a paragraph written at the students' level.

2. Have a student copy a poem or short story using upper and lower case

Projects:

1. Make a chart or bulletin board showing the special function keys and their use.

2. Make a model of the computer keyboard showing the special function keys.

THE COMPUTER KEYBOARD
KEYBOARD SKILLS -- APPLE II PLUS

Aim: What Are the Special Controls That We Use to Operate the Computer?

Performance Objectives: Students will be able to:

- explain the use of the keyboard, the various keys, and special-function keys
- demonstrate an understanding of the concept that the keyboard is the primary vehicle through which the user communicates with the CPU

Vocabulary: Function, cursor, prompt, space-bar, upper-case, lowercase, SHIFT, CONTROL, ESCAPE, RESET, REPT (repeat), symbols

Motivation

- Elicit responses to the following:
  - How does a driver control a car?
  - How does a pilot control an airplane?
  - How does a captain control a ship?
  - How do you operate a touch-tone telephone?
  - How does an office worker operate a mimeograph machine, adding machine, etc.
- Develop the concept that various kinds of equipment, from a simple telephone to a 747, must be operated and/or controlled by a person using devices such as buttons, switches, wheels, levers, etc.
- The advanced technology that we have been studying is the computer. What might we be trying to learn in this lesson?

Development:

1. How is our computer similar to a typewriter? (Both have keyboards which enable us to operate the devices.)

2. What are the differences in the keyboard of a typewriter and a computer keyboard? (Special symbols and keys, i.e., <, >, 0)

3. What is the little blinking square of light on the screen called? What is its function? (The little blinking square of light on the screen is called the cursor or prompt and is used to indicate where the next available space is.)

4. Find the space-bar on the computer keyboard. Press it. What happened? (The cursor on the screen moved as your pressed the space-bar.)

5. Make the cursor move six times.

6. What happens when you press the right arrow key? (The cursor moves one space to the right.)

7. What happens when you press the left arrow key? (The cursor moves back, or to the left.)

8. What are the different functions of these keys? (The right arrow key advances the cursor one space and the left arrow key moves the cursor back one space.)

9. What have you typed on the screen so far? (Nothing, but spaces are a form of output.)

10. How do you make letters or numbers appear on the screen? (You must press the appropriate keys.)

11. How do you clear the screen so that you can start writing at the top of the screen? (Press the ESC key, then type the symbol ' by pressing the shift key down and pressing the P. You can also type HOME and then press return.)

12. Clear the screen using one of the methods described in #11; then type your initials. Watch the screen. Where is the cursor now? (The cursor appears immediately after the last letter on the screen.)

13. Type one more letter and watch the screen. What has happened to the cursor? (The new letter appears, followed by the cursor.)

14. What does the position of the cursor tell the user? (The position where the next letter, number, or symbol will appear when it is typed.)

15. Make your initials appear five spaces apart from the last letter on the screen. (Press space-bar five times and then type your initials.)

16. Type in HOME or press the ESC key; then press the shift key and the letter P at the same time. What happens? (The screen is cleared and the cursor is now at the beginning of the first line of the screen.)

17. Now type in your complete name (first and last), leaving one space between names. How might you erase what you just wrote? (You could use the left arrow key to "back up" and erase the word.)

18. There is an easier way to erase an entire line. Type HOME and press return. What happened? (The screen is clear, but what you've typed is still in the computer's memory.)

19. We have discovered that the computer has special controls that let you do much more than you could with a typewriter. Let's start a list in our notebooks: (Elicit and place following chart on board.)

KEY(S)	FUNCTION (JOB) PERFORMED
Space bar	Moves cursor ahead; makes blank
Right arrow	Moves cursor ahead
Left arrow	Backspaces (moves cursor back)
ESC + Shift, P	Clears screen
RETURN	Moves cursor down to start of next line computer tries to follow instruction

20. We will be adding to this chart, but let's get some practice using what we have learned. Clear the display.

    . Type "I am learning to control the computer."
    . Erase the last letter.
    . Erase the last word.
    . Erase the entire line.

21. Retype the same sentence, but put two spaces between each word. Now continue to tap the space-bar and watch the cursor. What happened when the cursor reached the right-hand edge of the screen? (Cursor jumped down to the start of the next line.)

22. What other key will make the cursor move down? (RETURN)

23. Make the cursor move down almost to the bottom of the screen. Now watch carefully and make it move down to the bottom. Press RETURN again. What is happening on your screen? (The cursor is stationary, but the display is moving on the screen.)

    . Explain: The screen has a fixed number of 24 lines. To add additional lines, the top line is moved upward and is lost. This is called "scrolling".

24. How might you move the cursor upwards? (Hold down ESC and press I.)

25. How might you move the cursor back down? (Hold down ESC and press M.)

26. Now try this: Type "A", "ESC M", "B", "ESC M", "C", "ESC M", and so on. What do you see? (The letters form a diagonal line.)

27. Type HOME and press RETURN. Now hold down the REPT key and press A once. Release the REPT key. What happened? (The letter A repeated until the REPT key was released.)

28. The combination of REPT and ESC I or M can make the cursor move up or down on the screen. Hold down REPT, press ESC and I. Release. What happened? (The cursor moved down.)

29. Hold down REPT, press ESC and M. Release. What happened? (The cursor moved back up.)

30. The keys ESC and J move the cursor to the left. What other key does this? (Left arrow.)

31. The keys ESC and K move the cursor to the right. What other key does this? (Right arrow.)

32. We've learned a lot about controlling the computer. Let's turn to our chart again.

KEY(S)	FUNCTION (JOB) PERFORMED
REPT	Repeats any letter pressed.
ESC, I	Moves cursor up.
ESC, M	Moves cursor down.
ESC, J	Moves cursor left.
ESC, K	Moves cursor right.

Summary:

1. How are computer keyboards similar to typewriter keyboards?

2. How are computer keyboards different from typewriter keyboards?

3. What do we call that group of keys which allows us special control over the display?

4. What is the name of the blinking block of light? What is its purpose?

5. Describe what happens when a user presses each of the following keys or combination of keys:

   . Space bar
   . RETURN
   . REPT
   . ESC, I
   . Left arrow

Applications:

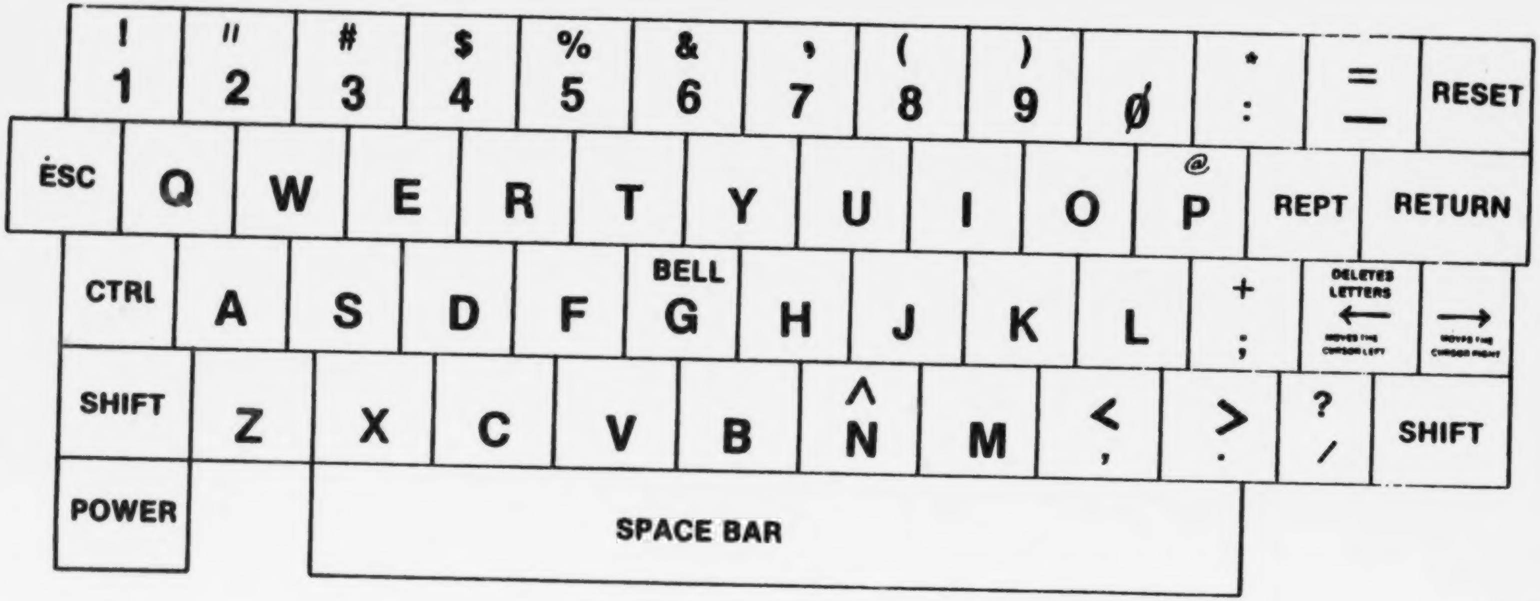
1. Type the numbers 109 in a diagonal line.

2. Type any letter several times by using the REPT key.

3. Cursor-Dance.

- Clear display.
- Place a line of 30 dots on your screen.
- Erase the last five.
- Erase five more.
- Erase the entire line.
- Bring cursor down two lines.
- Type your first name.
- Bring cursor down one line.
- Make cursor move 2 spaces.
- Type your last name.
- Bring cursor to start of next line.
- Type any three words.
- Bring cursor to start of next line.
- Type "I am done!"

APPLE II PLUS



! 1
" 2
# 3
$ 4
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RESET
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SHIFT
POWER
SPACE BAR

TOPIC 11
Practice Keyboard Skills on the Commodore Pet
A 'Generic' Lesson. See Notes on Page 2

Aim: How Do We Use the Special Control Keys On The Commodore Pet Keyboard?

Performance Objectives: Students will be able to:

- use the alphabet and number keys
- use selected special function keys
- demonstrate how to move the cursor around the screen

Vocabulary: cursor, space bar, DELETE, HOME, scrolls, functions

Motivation:

Show a typewriter and a computer. Ask "How are these two machines similar? different?

Development:

1. Note that computers and typewriters both have keyboards, but the computer has special keys to do special jobs or functions. Both have a specially-shaped key called a space bar. Ask "What happens when we press the space bar?" (Rectangle of light moved forward one space.)
2. State that this rectangle of light is called a cursor. Ask "what does this cursor show you?" Point out that the word comes from the Latin word meaning "runner". Press space bar several times.
3. Recall that the computer can do more than a typewriter. Find the key marked CRSR ---->. We call this the cursor right arrow key. Press it once. What happened? (The cursor moved to the right.)
4. Find the key marked CRSR <----. We call this the cursor left arrow key. Press this key and the SHIFT Key. What happened? The cursor moved backward one space.
5. Type your name. Press the CRSR <---- key one time and press the space bar. What happened?
6. Find the DEL key. Press it once. What happened? How is this key different from the CRSR key? What is this key used for? DEL stands for delete or to remove.
7. Find the HOME key. Press it once. What happened? (Cursor moved to the top and the screen stayed the same.)
8. Press the key marked "CLR" and the shift key. What happened? (Screen display disappeared, and the cursor moved to the top line.)

FUNCTION KEY CHART

KEY	FUNCTION (JOB) PERFORMED
Space-bar	Moves cursor ahead one space.
CRSR-Right Arrow key	Moves cursor ahead.
DEL	Backspaces and deletes one letter.
HOME	Returns Cursor to top of screen and keeps what is on the screen.
CLR + SHIFT	Returns cursor to top of screen and erases the screen.

9. Look at the keyboard and find the CRSR DOWN key. What is the function of this key. Try pressing this key.

10. Type your name. Press the CRSR DOWN key 25 times. What happened? Note that the screen has only 25 lines and that as you add more lines the top line scrolls (moves upward) and off the screen.

11. Press the return key twice. What happened? Cursor moved down two lines.

12. Type your name. Press the SHIFT key and the CRSR UP key. What happened? Cursor moved up two lines.

13. Press HOME and then press the "RVS" key. Type your name. What happened? (Letters printed in reverse.) What does RVS mean.

14. Press SHIFT + CLR and then press OFF. Type your name. What happened? (Reverse function turned off).

15. Add the following to the previous chart.

FUNCTION KEY CHART

KEY	FUNCTION (JOB) PERFORMED
SHIFT + CRSR UP	Moves cursor up.
RVS	Prints in Reverse.
OFF	Turns off reverse; prints normally.

Final Summary:

1. How are computer keyboards similar to typewriter keyboards?

2. How are computer keyboards different from typewriter keyboards?

3. What is the purpose of each special function key?

4. What do we call the blinking light? What is its function?

Applications:

1. Practice using the cursor keys to correct, add to or subtract from, a paragraph written at the student's level.

Projects:

1. Make a chart or bulletin board showing the special function keys and their use.
2. Make a model of the computer keyboard showing the special function keys.

THE COMPUTER KEYBOARD
KEYBOARD SKILLS -- PET

Aim: What Are the Special Controls That We Use to Operate the Computer?

Performance Objectives: Students will be able to:

- explain the use of selected regular and special-function keys
- use these keys to achieve the results for which they are intended
- demonstrate an understanding of the concept that the keyboard is the primary vehicle through which the user communicates with the CPU.

Vocabulary: NEW: function, cursor, cursor-control, space-bar, upper-case, lowercase

REVIEW: Screen, keyboard

Motivation:

- Elicit responses to the following:
  - How does a driver control a car?
  - How does a pilot control an airplane?
  - How does a captain control a ship?
  - How do you operate a touch-tone telephone?
  - How does an office worker operate a mimeograph machine, adding machine, etc.
- Develop the concept that various kinds of equipment, from a simple telephone to a 747, must be operated and/or controlled by a person using devices such as buttons, switches, wheels, levers, etc.
- The advanced technology that we have been studying is the computer. What might we be trying to learn in this lesson?

Development:

1. How is our computer similar to a typewriter? (Both have keyboards which enable us to operate the devices.)

2. Computers and typewriters both have keyboards, but the computer has special keys to do special jobs. Let's look at some of these. Both have a special-shaped key called a space-bar. What happens when you press the space-bar of a typewriter? (Carriage moves ahead one space.)

3. Find the space-bar on the computer keyboard. Press it once while you watch the screen. What happened? (The flashing rectangle of light moved.)

4. What e rectangle of light called? (Elicit or state that it is called a "cursor", which is Latin for "runner".

5. Press the space-bar and hold it while you count to three. What happened? (The cursor moved more than one space.) (On older PETs the cursor only moves once.)

6. Make the cursor move ten times. Be careful not to hold the space-bar down too long. (Students will either hold down the space-bar or press it ten times.)

7. Find the key marked "RETURN" and press it. What happened? (Cursor returned to left side of screen, one line lower than before.)

8. Remember that we said the computer can do more than a typewriter. Let's find the key marked "HOME". Press the HOME key. What happened? (Cursor returned to upper left corner of screen.) (The sign-on message should still be there.)

9. Press the space-bar once. What happened? (A space appeared and the cursor moved.)

10. Now find the key marked "CRSR" ----> (right arrow). This is the cursor right key. Press it. What happened? (The cursor moved, but the blank did not appear.)

11. Now find the key marked "CRSR" <---- (left arrow). How can you press it? (It is the same key as CRSR right.) Find the key marked "SHIFT"; there are two of them. Press the shift key and the CRSR left. What happened? (The cursor backed up one space.)

12. What have we typed so far? (Nothing, or spaces.)

13. How could we make letters or numbers appear on the screen? (Press appropriate keys.)

14. Find the CRSR down key. Press it once. What happened? (The cursor moved down one line.)

15. Move the cursor down to a blank line. Now type your initials. Watch the screen. Where is the cursor now? (Cursor appears immediately after the last letter on the screen.)

16. Type a space and watch the screen. What happened? (Cursor moved, leaving a space.)

17. Make your initials appear five spaces away from the last letter on the screen. (Student will press space bar to move cursor four more times, then type initials.)

18. Press the RETURN key. What happened? (Computer prints: ?SYNTAX ERROR READY.)

19. When you press the Return key, the computer tries to carry out the instruction that you have typed. Your initials are not an instruction. The message "?SYNTAX ERROR" means "That is not an instruction".

20. Find the key marked "CLR". Now press the shift key and the key marked "CLR". What happened? (The screen display disappeared. The cursor is now at the start of the top line.)

21. We will now type our complete names, leaving one space between words. How might we erase what we just wrote? (Use CRSR left arrow to "back up" and erase word.)

22. There is an easier way to erase letters. Press RETURN. Now type your name again. Find the key marked "DEL" and press it once. What happened? (One letter disappeared and the cursor backed up.)

23. We have just discovered that the computer has special controls that let you do much more than you could with a typewriter. Let's start a list in our notebooks of these special keys: (Elicit and draw the following chart on the board.)

KEY(S)	FUNCTION (JOB) PERFORMED
Space-bar	Moves cursor ahead; makes a blank.
CRSR right	Moves cursor ahead.
DEL	Backspaces and erases.
CRSR down	Moves cursor down.
RETURN	Moves cursor down and to the start of the next line. Computer tries to follow instruction.
HOME	Returns cursor to top left corner of screen.
SHIFT + CLR	Clears screen, homes cursor.

24. We will be adding to this chart, but let's get some practice using what we have learned. Clear the display.

    - Type "I am learning to control the computer."
    - Erase the last letter.
    - Erase the last word.
    - Erase the entire line.

25. Retype the same sentence, but put two spaces between each word. Then continue to tap the space-bar (or hold it down). What happened when the cursor reached the right-hand edge of the screen? (Cursor jumped down to the start of the next line.)

26. What other key will make the cursor move down? (CRSR down, and RETURN)

27. Make the cursor move down almost to the bottom of the screen. Now watch carefully and make it move down to the bottom. Press the key again. What is happening on your screen? (The cursor is stationary, but the display is moving off the screen.)

    Explain: The screen has a fixed number of lines, 25. To add additional lines, the top line is moved upward and is lost. This is called "scrolling".

28. How might you move the cursor upwards? (Use SHIFT + CRSR up, or CLR.)

29. Now try this: Type "A", CRSR down, "B", CRSR down, "C", CRSR down, and so on. What do you see? (The letters form a diagonal line.)

30. Press HOME. Now find the key marked "RVS" and press it. Use the CRSR right key to find a blank space on the line. Type "A" and CRSR down. What happened? (The "A" is in reverse with a light background.)

31. Make another diagonal of reverse letters. How might you make the typing normal again? (SHIFT + OFF) (Return also turns off reverse.)

32. We've learned a lot about controlling the computer. Let's turn to our chart again.

KEY(S)	FUNCTION (JOB) PERFORMED
SHIFT + CRSR up	Moves cursor up.
RVS	Prints in reverse.
OFF	Turns off reverse; prints normally.

Summary:

1. How are computer keyboards similar to typewriter keyboards?

2. How are computer keyboards different from typewriter keyboards?

3. What do we call that group of keys which allows us special control over the display

4. What is the name of the blinking block of light? What is its purpose?

5. Describe what happens when a user presses each of the following keys or combination of keys:

    . Space-bar
    . CRSR right
    . CRSR left
    . RETURN
    . DEL
    . CRSR down
    . SHIFT + CRSR up
    . CLR
    . HOME
    . RVS
    . SHIFT + OFF

Applications

1. Clear display. Make the following sentence appear:

   THESE ARE ALL CAPITAL LETTERS.

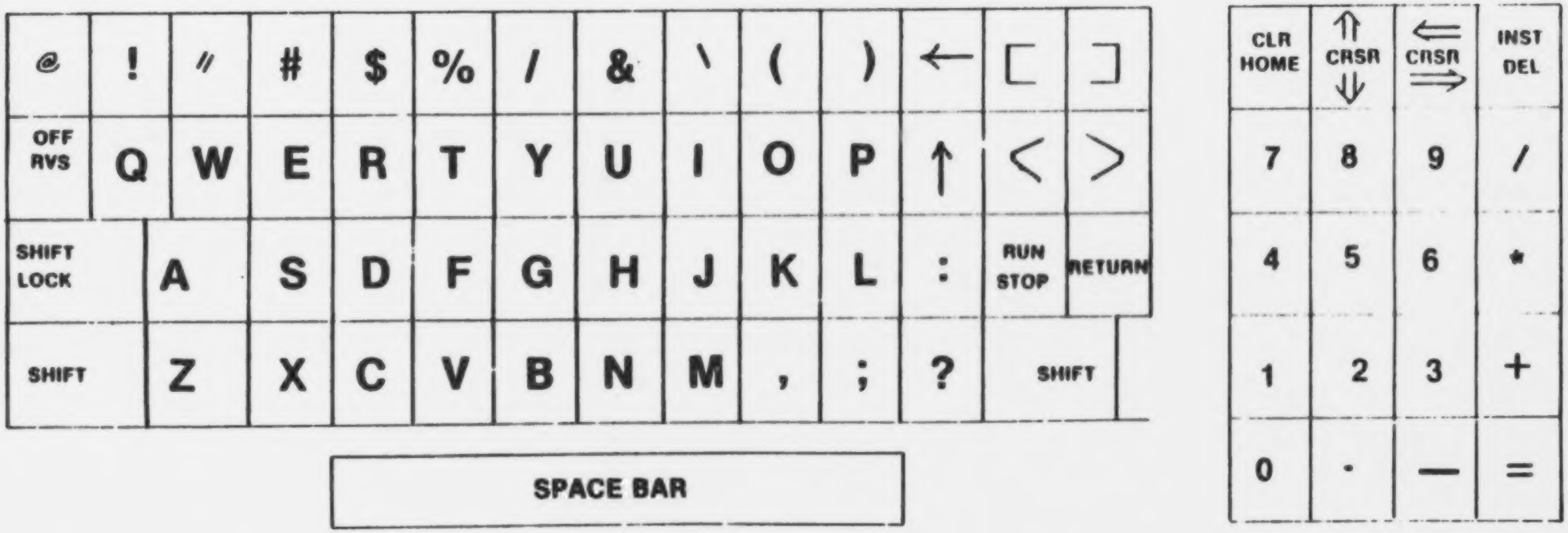
2. Type the same sentence in reverse letters.

3. Make the computer type "?SYNTAX ERROR READY."

4. Cursor-Dance.

   - Clear display.
   - Place a line of 30 dots on your screen.
   - Erase the last five.
   - Erase five more.
   - Erase the entire line.
   - Bring cursor down two lines.
   - Type your first name.
   - Bring cursor down one line.
   - Make cursor move 2 spaces.
   - Type your last name.
   - Make cursor go to start of next line
   - Type same three words in reverse.
   - Erase the entire last line.
   - Retype it.
   - Type "I am done!"

PET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TOPIC 12
Practice Keyboard Skills on the TRS 80
A 'Generic' Lesson. See Notes on Page 2

Aim: What Are The Special Controls That We Use To Operate The Computer?

Performance Objectives: Students will be able to:

- explain the use of selected regular and special-function keys
- use these keys to achieve the results for which they are intended
- demonstrate an understanding of the concept that the keyboard is the primary vehicle through which the user communicates with the CPU

Vocabulary: NEW: function, cursor, space-bar, upper-case, lower-case, upper-lower case

REVIEW: Screen, keyboard

Motivation:

Elicit responses to the following:

- How does a driver control a car?
- How does a pilot control an airplane?
- How does a captain control a ship?
- How do you operate a touch-tone telephone?
- How does an office worker operate a mimeograph machine, adding machine, etc.

Develop the concept that various kinds of equipment, from a simple telephone to a 747, must be operated and/or controlled by a person using devices such as buttons, switches, wheels, levers, etc.

- The advanced technology that we have been studying is the computer. What might we be trying to learn in this lesson? Elicit AIM.

Development:

1. How is our computer similar to a typewriter? (Both have keyboards which enable us to operate the device.)

2. Computers and typewriters both have keyboards, but the computer has special keys to do special jobs. Let's look at some of these. Both have a specially-shaped key called a space-bar. What happens when you press the space-bar of a typewriter? (Carriage moves ahead one space.)

3. Find the space-bar on the computer keyboard. Press it once while you watch the screen. What happened? (Rectangle of light moved.)

4. What is the rectangle of light called? (Elicit or state that it is called a "cursor" which is Latin for "runner.")

5. The cursor moves when you press the space-bar. Make it move ten times. (Students will press space-bar ten times.)

6. Recall that we said the computer can do more than a typewriter. Let's find the key marked ----> (right arrow). Press it once. What happened? (Cursor moved ahead 8 spaces. Repeat to prove.)

7. Find the key marked <---- (left arrow). Press it once. What happened? (Cursor "backed up" one space.) Repeat to prove.

8. What is the difference between the way the right and left arrow keys function? (Right arrow advances cursor eight spaces each time. Left arrow moves cursor back only one space at a time.)

9. What have we typed on the screen so far? (Nothing, or spaces. Spaces are a form of output.)

10. How could we make letters or numbers appear on the screen? (Press appropriate keys.)

11. Press the key labeled "CLEAR". Now type your initials. Watch the screen. Where is the cursor now? (Cursor appears immediately after last letter on screen.)

12. Type a space and watch the screen. What happened? (Space appeared, followed by cursor.)

13. What might the position of the cursor tell the user? (Where the next letter or number will appear when typed.)

14. Make your initials appear five spaces away from the last letter on the screen. (Screen displayed disappeared. Cursor is now at the start of the top line.)

15. Press the key labeled "CLEAR". What happened? (Screen displayed disappeared. Cursor is now at the start of the top line.)

16. We will now type our complete names, leaving one space between words. How might we erase what we just wrote? (Use left arrow to "back up" and erase word.)

17. There is an easier way to erase an entire line. Try this: Press "CLEAR". Retype your full name. Now, hold down the "SHIFT" key and press the left arrow key. What happened? (SHIFT + left arrow erases entire line and returns cursor.)

18. We've just discovered that the computer has special controls that let you do much more than you could with a typewriter. Let's start a list in our notebooks of these "special-function" keys. (Elicit and place the following chart on the chalkboard.)

KEY(S)	FUNCTION (JOB) PERFORMED
Space-bar	Moves cursor ahead one position.
CLEAR	Clears screen, returns cursor.
----> (right arrow)	Moves cursor 8 spaces forward.
<---- (left arrow)	Backspaces and erases one position.
SHIFT + (left arrow)	Erases entire line, returns cursor.

19. We will be adding to this chart, but let's get some practice using what we have learned. Clear the display.

. Type "I am learning to control the computer."

. Erase the last letter.

. Erase the last word.

. Erase the entire line.

20. Retype the same sentence, but put two spaces between each word. Continue to tap the space-bar and watch the cursor. What happened when the cursor reached the right-hand edge of the screen? (Cursor jumped down to the start of the next line.)

21. Examine your keyboard. Is there a key that might make the cursor move down to the next line? (Down arrow.)

22. Press the down arrow key five times. Where is the cursor key now? Continue to press this key until the cursor will not go down any further. What is happening on your screen? (Display is moving off the top of the screen. Cursor remains stationary.)

Explain: The screen has a fixed number of lines (16). To add additional lines, the top line is moved upward and is "lost". (Up arrow will not move cursor upwards.) Pressing "CLEAR" will clear the video display and move the cursor up.

23. We are now ready to have some fun with our computer.

. CLEAR your screen.

. Press SHIFT + right arrow.

. What happened to the cursor? (Letters appear to be "double-width.")

. Leave one space after your name and add "is learning to use the keyboard."

. What happened on the screen? (Sentence was continued on the next line.)

. Why did such a short sentence take up so much room? (Each letter is now double-width. Thus, half as many letters will fit on a line.)

24. Press "CLEAR". Type the same sentence. Why did it fit on one line now? (Pressing "CLEAR" changes the display form double to normal width in addition to moving the cursor up.)

25. Let's learn one more trick with our computers. Press "CLEAR" again. Type this sentence exactly as it is shown on the board, "BOOKS DON'T LOOK LIKE THIS." Why don't they? (The above sentence is written with all capital letters, or upper-case. Books are printed with a mixture of capital and small letters, or upper-lower case.)

26. Let's make the screen display look more like the printed page.

    . Hold down the SHIFT key and press zero. Now type the exact same sentence. Why does it still look strange? (They are all small, or lower-case letters.)

    . How could we add capital letters to each word? (As on a typewriter, the SHIFT key must be held down to obtain capitals.)

27. Type this sentence, but make each word start with an upper-case letter: "The Computer Uses Upper And Lower Case If You Know The Secret."

28. Hold down the SHIFT key and press zero again. Now type, "HEY, WHAT HAPPENED?" What did happen? (Display is now once again in upper-case mode.)

    . What is the function of SHIFT + 0 (zero)? (It switches in and out of upper case or lower case mode. It provides an either/or function, like a toggle switch.)

29. We've learned a lot more about controlling the computer. Let's turn to our chart again:

KEY(S)	FUNCTION (JOB) PERFORMED
(down arrow)	Moves cursor to beginning of next line.
SHIFT + ----> (right arrow)	Creates double-width letters.
CLEAR	Returns to normal-width (clears display).
SHIFT + 0 (zero)	Switches upper-case to lower-case and vice-versa.

Final Summary:

1. How are computer keyboards similar to typewriter keyboards?

2. How are computer keyboards different from typewriter keyboards?

3. What do we call that group of keys which allows us special control over the display?

4. What is the official name of the blinking block of light? What is its purpose.

5. Describe what happens when a user presses each of the following keys or combination of keys:

   - CLEAR
   - Space bar
   - Right arrow ---->
   - Left arrow <----
   - Down arrow
   - SHIFT + <---- (left arrow)
   - SHIFT + ----> (right arrow)

Applications:

1. Clear display. Make the following sentences appear exactly as shown:

   - "THESE LETTERS ARE TOO BIG", SAID GOLDILOCKS!
   - "these letters are too small", said goldilocks!
   - "These letters are just right", said Goldilocks!

2. Return to upper-case. Do the following:

   - Type "FAT CATS ARE FUN" in double-width.
   - Bring cursor down two lines.
   - Type "SKINNY CATS ARE FUN ALSO" in normal-width.
   - Type "this is fun" in normal-width, all lower-case.
   - Bring cursor down one line; type "This is more fun" in double-width.

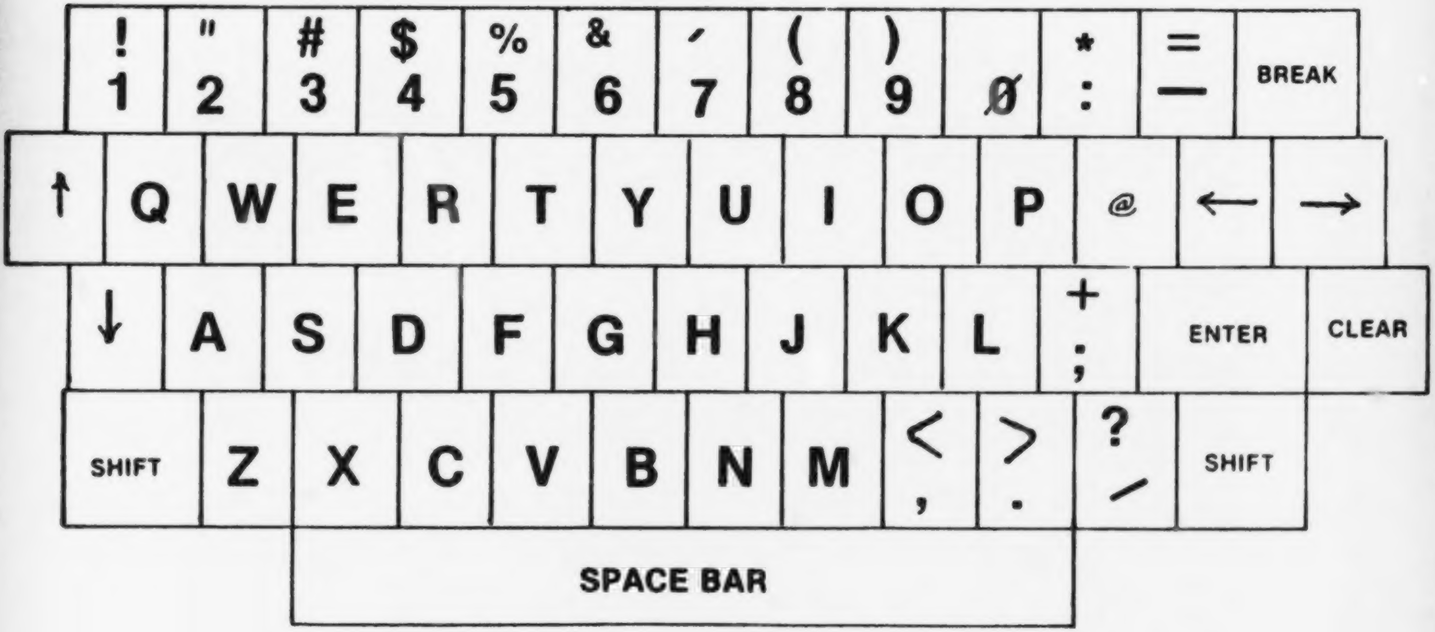
3. Cursor-Dance.

   - Clear display.
   - Place a line of 30 dots on your screen.
   - Erase the last five.
   - Erase five more.
   - Erase the entire line.
   - Bring cursor down two lines.
   - Type your first name.
   - Bring cursor down one line.
   - Make cursor move 16 spaces ahead.
   - Type your last name.
   - Make cursor move 24 spaces ahead.
   - Type any three words.
   - Erase the entire last line.
   - Retype it.
   - Type "I am done!"

4. Surprise Message

   - Clear display.
   - Type "SAMTINLEED!" exactly as shown.
   - Hold down Shift key and press right arrow. What happened?
   - Display changed to "SMILE!": Because double-width mode absorbs two spaces for each letter, obliterating "A, T, N, E, D" in SAMTINLEED!
   - Have students design their own surprise messages.

TRS 80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SHIFT
SPACE BAR

TOPIC 13
The Microcomputer as a Word Processor

Aim: How is a Word Processor Different Than a Typewriter?

Performance Objectives: Students will be able to:

- understand the difference between a typewriter and a word processor
- identify the usefulness of word processing in the world around us

Vocabulary: word processor, highlighting, search, replace

Motivation:

Have the students write a short composition or letter. As they are doing this the teacher should go around the room correcting any mistakes. After an appropriate amount of time ask the class "What would you have to do to hand in a perfect paper?"

Development:

1. Elicit from the students that there were many mistakes and that they would have to write the composition or letter over until they got it correct. Ask the class "Do you know an easier way to correct the paper?"

2. Elicit that they could do the work on a typewriter and use a special correction paper or liquid. Point out that this is messy and time consuming.

3. Tell the children that there is a computer program called a word processor that will allow you to change what you wrote and print it out in a neat form.

    a. Define word processor as a computer program that works like a typewriter that will let you correct your mistakes before you hand in the finished product.

    b. There are many different word processors for every type of computer.

    c. SPECIAL NOTE TO TEACHERS - You should become familiar with your computer keyboard and a word processing package for your machine. Carefully read the manual for the program so that you can relate this lesson and future lessons to the word processing program that you have selected.

4. Describe several jobs that a word processor can do that a typewriter can't do.

a. A word processor shows all of the work on a monitor before it is sent to a printer.

b. All of the words that are spelled wrong, can be changed on the screen.

c. If you leave out a word or sentence, the word processor will let you put it in without ruining the rest of the work.

d. You can save your work, and then bring it back at a later date to change it or add to it.

e. Like a typewriter, you can use many different styles of type, but you don't have to change a part of the machine.

f. A word processor allows you to move the words around so that the final product will look neat.

g. This program allows you to print several copies of the same report without retyping it.

h. Charts and tables are easily prepared with a word processor.

i. Highlighting or printing words darker can be done with most word processing programs.

j. You can search for and replace any word. For example if you spelled the word "receive" wrong, you can easily search for it and correct it.

5. Develop a chart with the students showing some of the differences between a typewriter and a word processor.

JOB	TYPEWRITER	WORD PROCESSOR
Put letters on a page	YES	YES-with printer
Correct wrong letters	YES-with special material	YES
Put in words that you left out	NO	YES
Change the order of words	NO	YES
Save your work	NO	YES
Bring back the work you saved	NO	YES
Use different type styles	YES-with special parts	YES
Move words around the page	NO	YES
Print several copies	YES-with carbon paper	YES YES
Charts/Tables easily made	NO	YES
Highlighting of words	NO	YES
Search and replace	NO	YES

6. Ask the class "Who would find a word processor useful?"

   a. Elicit that businesses send out many of the same letters with just the names changed.

   b. Lawyers need to change only small sentences in standard legal forms.

   c. Newspapers and magazines use word processors to lay out the page neatly and to send it over phone lines to the printers.

   d. Teachers use word processors to make up tests and reading lessons.

   e. Students use these programs to hand in reports.

   f. Parents can use word processors to send letters to all of their friends and relatives.

7. Ask the class "Why would a business spend many hundreds of dollars for the micro computer and a word processor?"

   a. Word processing saves much time. A secretary will get the job done faster on a word processor than on a typewriter.

   b. When a business saves time, it also saves money.

   c. Many business documents can be stored on small computer disks and not take up a lot of file space. Therefore offices can be made smaller and they save on rent.

Final Summary:

1. Why is a word processor better than a typewriter?

2. How has word processing changed the business world?

3. How is a word processor useful in everyday life?

Applications:

1. Take a survey of the class to see if the students have computers and word processors.

2. Bring in one of the schools microcomputers and briefly demonstrate a word processor.

3. Make a bulletin board display showing the differences between a typewriter and a word processor.

Projects:

1. Create a word processing history book. Research the history of word processing and write a report.
2. Where are word processors used in your neighborhood? Students should contact local business to see if (and how) they are using word processing.

TOPIC 14
Working Knowledge of a Word Processor

Aim: How Do We Make Our Word Processor Work?

Performance Objectives: Students will be able to:

. boot up a word processing program
. understand the different subsystems of a word processor
. gain a working knowledge of a word processor

Vocabulary: boot, format, editor, input, text, files, filer, store, saved

Motivation:

Demonstrate a word processing package.

Development:

1. Tell the class that when we insert the computer disk into the disk drive, and turn the machine on, we call this "booting" the program.

   a. Depending on the number of microcomputers available, have each child boot the program or the teacher should demonstrate it.

   b. The students could work in small groups, with each child spending some time on the machine.

2. SPECIAL NOTE TO TEACHERS - Since there are many types of microcomputers, and many word processing programs for each kind of computer, it is imperative that you become familiar with your machine and your program and adjust the following lessons to that combination.

3. Ask the class "What do you have to do when you want to write a composition?"

   a. Elicit the following from the class:
      (1) You need a pencil and paper.
      (2) You decide on the margins.
      (3) You begin writing.

   b. Explain to the class that a word processor works in the same way.
      (1) You boot the computer program.
      (2) You set the margins.
      (3) You begin writing.

4. Tell the class that after you boot the program, you should enter the FORMAT part of the program.

   a. The format of a page tells the computer how the paper looks after you set the margins.

   b. Ask a student to measure a standard sheet of paper. Elicit that it measures 8-1/2" by 11".

   c. Tell the class that a word processor prints 6 lines per inch. Ask "What is the most lines we can get on a page that measures 11 inches long?

      (1) If you use regular paper you would tell the computer that the page is 66 lines long.
      (2) If you used legal paper that is 14 inches long you would tell the computer that it is 84 lines long. (14 x 6)

   d. Tell the class that a word processor has many type styles but it usually prints 10 letters per inch across the page. Elicit that an 8-1/2" wide paper could print 85 letters across the page.

      (1) Ask the class "If you wanted a left margin of one inch, how many spaces would you have to leave?"
      (2) Ask "If you wanted a one-inch left margin and a one-inch right margin, how many letters could you type between the margins?"

   e. State that you can also set the line spacing to double space in the format system.

5. Tell the class that like the editor of a newspaper, we also do our writing in the EDITOR section of the word processor program.

   a. Have the students write (input) the heading on the paper.

   b. Next have the student write several sentences.

      (1) The teacher should go around the room pointing out any mistakes that the students made.
      (2) Do not, at this point, explain how to correct any mistakes. Tell the students that they will have a chance to correct their papers in the next lesson.

   c. Explain to the class that what each student has written is called text.

6. When the students have entered several sentences ask "What would happen to our text if we shut off the machines?" Elicit that we must save our text before we shut off the machines.

7. Explain to the class that our text, like paper, is stored in files in the FILER section of the word processing program.

   a. Tell the class that all files must have a name so that they can be stored or saved on a disk.

   b. Have the students save the work that they created today.

Final Summary:

1. How do we start our word processing program?

2. What do we have to do to set up our page?

3. Where do we enter text in a word processor?

4. How do we prevent the text from being lost?

Applications:

1. When working in groups, have the students talk to each other on the computer. This is a running dialogue similar to a play.

2. Write a poem.

3. Give the students the first line of a story and let them complete it.

4. Have the students write a new and modern ending to an old fairy tale.

5. Have the children write a story about a class trip or science experiment.

6. Write a letter requesting something special.

Projects:

1. Start to plan to have a class newspaper or subject magazine.

2. Have the students write a "Famous People" booklet. The subjects for this writing assignment are all staff members.

3. Have the class write letters to their elected representatives and tell them how they feel about a special topic.

TOPIC 15
Entering Text in a Word Processor

Aim: How Can We Enter Text Into a Word Processor?

Performance Objectives: Students will be able to:

- retrieve a saved file
- know what a cursor is
- move the cursor around the screen

Vocabulary: load, retrieve, cursor, control key or function key

Motivation:

Remind the students that they typed in many words last time and that you noted some mistakes. Today they will get the chance to correct them and turn in a perfect paper.

Development:

1. Have the students boot the word processor and enter the filer portion of the program. Tell that class that they have to bring back, or retrieve the typing they saved yesterday. This is called loading a file.

2. Point out to the class that the format that was used yesterday was also saved with the words.

3. Have the students load their file.

4. Remind the students that they have to go into the editor section of the program to fix, or add onto, their work.

   Define cursor as the place on the screen that shows you where you are located. Show the class the cursor. Ask the students "How can we change a spelling mistake?" Elicit that we have to know how to move the cursor around the screen.

5. Note that many word processing programs make you use special function or control characters to move the cursor. Show the students how you must hold down these special keys and press a second key at the same time.

6. Develop a chart with the students to show them how the use of control characters help to move the cursor around the screen.

CURSOR CONTROL CHART

WHAT YOU WANT TO DO	WHAT KEYS DO YOU PRESS
To move the cursor up	Hold down the____key and press_____
To move the cursor down	Hold down the____key and press_____
To move the cursor left	Hold down the____key and press_____
To move the cursor right	Hold down the____key and press_____
To erase an extra letter	Hold down the____key and press_____
To add a letter	Hold down the____key and press_____
To change one letter to another letter	Hold down the____key and press_____

7. Have students correct the work that they typed in during the last lesson. The teacher should walk around the room to make sure that all mistakes are corrected.

8. Review the procedures to save a file. Have the students save their file. Point out that if they use the exact same name for their file as they used before, the program will wipe out their old file and replace it with the new and corrected version.

9. Have the students copy the following paragraph and save it. This will be used in the next lesson.

> Once upon a time there wwas a little girl with a red cape
> who wnet into the wooods toher grandma's horse. On here
> way she stopped to pick some very preti wild fowers.
> She went along singing a song that she made up.

Final Summary:

1. How do we bring back the file that we saved in the last lesson?

2. What is the purpose of a cursor?

3. How do we move the cursor around the screen?

Applications:

1. Write a short story that we can enter into the word processor.

2. Write a poem that you can enter into the word processor.

3. Copy a short article from a newspaper or magazine.

4. Create a bulletin board showing the direction that the cursor moves and the keys that must be pressed to create that motion.

Projects

1. Continue to work on, or introduce, the projects in the last lesson.

2. Using the word processor, make a list of magazine articles that tell about word processing. Summarize each article.

TOPIC 16
Editing and Printing Text

Aim: How Can We Edit and Print What We Wrote?

Performance Objectives: Students will be able to:

- delete letters, words and sentences
- insert letters, words and sentences
- print the document on paper

Vocabulary: editing, deleting, inserting, buffer, printer

Motivation:

Show the students compositions before corrections with a lot of red marks, and after corrections with 100% written on the top. Ask them which looks better.

Development:

1. Have the students load the material that they typed yesterday. Then enter the editor.

   Once upon a time there wwas a little girl with
   a red cape who wnet into the wooods toher grandma's
   horse. On here way she stopped to pick some very
   preti wild fowers. She went along singing a song
   that she made up.

2. Tell the students that there are many mistakes. State that the process of correcting these mistakes is called editing. This is why they are in the editor portion of the word processing program.

   Ask them; "How can we erase the extra 'w' in 'wwas' in the first line?" Point out to them that if you just erased the "w" there would be an empty space. The process of removing a letter, word, sentence, line or paragraph is called deleting.

3. Show the students the appropriate procedure to use with the word processor you have selected, to delete a letter. Tell them that they could delete many letters in a row in order to delete a whole word or sentence. If your word processor has a special command to delete a full word or paragraph, introduce it at this time.

4. Have the students correct the misspelled words in the rest of the paragraph. Ask the students what they would have to do to correct the word "toher". Elicit that you have to put in a space between the word "to" and "her". The process of putting in a letter, word, sentence. line or paragraph is called inserting.

5. Show the students the appropriate procedure to insert a letter. Then have the students add the word "happy" before the word song.

6. Have the children save the above work.

7. Tell the children to create a happy song. This could then be added to the story that was saved. The teacher should go around the room and tell students to insert or delete words in their work.

8. Develop a chart with the students to show them how the use of control characters help to edit the document.

EDITING CONTROL CHART

WHAT YOU WANT TO DO	WHAT KEYS DO YOU PRESS
To delete a letter	Hold down the____key and press____
To delete a word	Hold down the____key and press____
To delete a sentence	Hold down the____key and press____
To insert a letter	Hold down the____key and press____
To insert a word	Hold down the____key and press____
To insert a sentence	Hold down the____key and press____

9. Once the students have their work corrected and saved, they are now ready to have the work printed.

10. Show the students an older typewriter. Point out that each letter is on an arm, and that when you press a key, the arm comes up and the letters hit the ribbon - forcing ink onto the paper. This is a mechanical printing machine. There is only one type style per machine.

    Show the students a typewriter that uses a rotating ball. Show them that the ball contains all of the letters, numbers and special symbols on it. Tell them that when you hit the keys an electrical signal tells the ball which way to face. By changing the ball you can change type styles.

    Show the students a typewriter that uses a daisy wheel. Point out that this machine is similar to the above ball typewriters, but that it uses a different method of holding the letters. This machine also has many type styles.

11. Show the class the dot matrix printer that is attached to the computer. Ask them "How is this machine different from the typewriters they just saw?" Elicit that there are no characters stored on keys, ball or wheel.

Tell the students that this type of printer uses many little wire pins. These pins pop out or stay in, depending upon what electrical signals are sent to them.

```
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. . * . * . .
. * . . . * .
* . . . . . *
.**********.
* . . . . . *
* . . . . . *
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```

When you press the letter "A" the pins that form this letter pop out.

12. Distribute some material that was printed on a dot matrix printer. Show the various capabilities of your machine, e.g. bold face, compressed, expanded, italic or any other special type style.

13. Show the students how to enter the printer portion of your word processing program. Since there are many printer-computer-word processor combinations, become familiar with your combination before demonstrating them to your class.

<u>Final Summary</u>:

1. How do you delete material from your document?

2. What must you do to insert characters into your document?

3. How do we print the words that we wrote with the word processor?

<u>Activities</u>:

1. Prepare poems or short stories on a disk. Have the students load these into the machine and correct them.

2. Print out a chart, using the word pocessor, showing all of the special control features.

3. Allow the students to create special pictures using the word processor. There are many "typing" books that give detailed instructions on how to do this.

4. Create a bulletin board showing compositions before and after corrections.

5. Create a bulletin board showing the capabilities of a word processor in creating calendars and pictures.

Projects:

1. Have the students prepare a manual on how to use a word procesor.
2. Have the students prepare a manual on how to use a printer.
3. Prepare an emergency address and phone list of local neighborhood services - e.g., Police, Fire, Hospital, School, etc.

WORKSHEET

```
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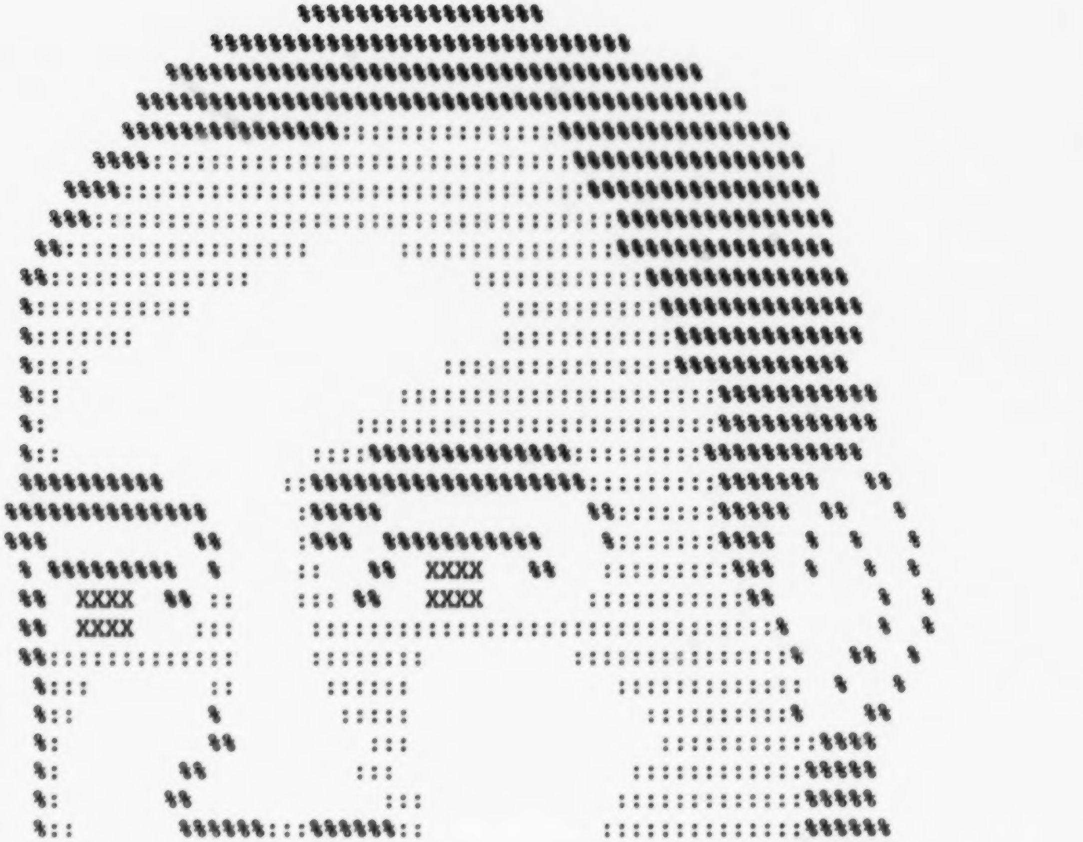
WORKSHEET



TOPIC 17
Typing in Programs

Aim: How Can a Computer Work Like a Typewriter?

Performance Objectives: Students will be able to:

- key in programs
- save the programs that they keyed in
- run the programs that they saved
- show how a computer is like a word processor

Vocabulary: keyed in, run, list, program

Motivation:

Key in the following program.

```
10 PRINT "    *    "
20 PRINT "   ***   "
30 PRINT "  *****  "
40 PRINT " ******* "
50 PRINT "    *    "
60 PRINT "    *    "
70 PRINT "    *    "
80 END
```

Development:

1. Ask the students "Was this run on a word processor?" Point out to the students that a computer can sometimes work like a word processor.

2. List the program for the students. Tell the class that what they are looking at is a list of instructions telling the computer what to do. A list of instructions that tells a computer what to do is called a program.

3. Ask the class "How can we save this set of instructions so that we don't have to retype it every time we want the computer to use the list?" Remind the students that this was the same thing we did with the word processor text.

4. Tell the class that when you want the computer to follow this program you must tell it to "run" the program.

5. Distribute the worksheet on the next page.

   a. Have the class look at the list and state what they see. Elicit that each line begins with a number.

   b. Point out that these numbers are like steps in a recipe, and that they are followed one step at a time.

   c. Ask "Why are they numbered by ten?" Elicit that we do this to leave lines free in case we need to add steps to our recipe or program, to make it work better.

6. Have the students key in, save and run the programs that follow.

SAMPLE BASIC PROGRAMS

```
        SAMPLE #1               :            SAMPLE #2
                                :
10 PRINT "I LIKE"               : 10 PRINT "STUDENTS NAME"
20 PRINT "WORKING THE"          : 20 GOTO 10
30 PRINT "COMPUTER"             : 30 END
40 END                          :
                                :
--------------------------------:--------------------------------------
        SAMPLE #3               :            SAMPLE #4
                                :
10 LET A = 14                   : 100 PRINT "WHAT IS YOUR NAME?"
20 PRINT A                      : 110 INPUT N$
30 A = A + 2                    : 120 PRINT
40 PRINT A                      : 130 PRINT "HOW OLD ARE YOU?"
50 A = A * 4                    : 140 INPUT A
60 PRINT A                      : 150 PRINT "I WILL NOW PRINT"
70 A = A / 2                    : 160 PRINT N$;"";A;" TIMES"
80 PRINT A                      : 170 FOR X = 1 TO A
90 A = A - 2                    : 180 PRINT N$
100 PRINT A                     : 190 NEXT X
110 END                         : 200 END
                                :
--------------------------------:--------------------------------------
                                :
        SAMPLE #5               :            SAMPLE #6
                                :
10 LET N=5                      : 10 REM HELPS YOU COUNT
20 PRINT "HOW MANY DAYS WILL    : 20 FOR I = 1 TO 10
   YOU HIKE?"                   : 30 PRINT I
30 INPUT D                      : 40 NEXT I
40 LET M = N * D                : 50 REM NOW TO BLINK
50 PRINT " AT THE RATE OF ";    : 60 FOR I = 1 TO 10
   N;" MILES PER DAY"           : 70 PRINT "BLINK"
60 PRINT " YOU CAN HIKE ";M;    : 80 REM A WAITING LOOP
   " MILES"                     : 90 FOR J = 1 TO 500
70 PRINT "IN ";D;" DAYS."       : 100 NEXT J
80 GOTO 10                      : 110 NEXT I
90 END                          : END
                                :
--------------------------------:--------------------------------------
```

SAMPLE #7

```
10 PRINT "TELL ME THE NAME OF YOUR FRIEND ";N$
20 PRINT "TELL ME YOUR FAVORITE COLOR ";C$
30 PRINT "WHAT DO YOU LIKE TO EAT? ";E$
40 PRINT "IF YOU WILL WAIT A FEW SECONDS"
50 PRINT "I'LL TELL YOU A SHORT STORY."
60 PRINT:REM WAITING LOOP
70 PRINT
80 PRINT "I JUST CAME BACK FROM THE BEACH."
90 PRINT "I SAW YOUR FRIEND ";N$;" EATING"
100 PRINT "A "; C$; PRINT ""; E$
110 PRINT "DON'T YOU WISH YOU HAD ONE TOO?"
```

TOPIC 18

Cassette Recorders and Tapes: Their Function and Care

Aim: Why Are Cassette Recorders And Tapes Used With Computers?

Performance Objectives: Students will be able to:

- know the functions of a cassette recorder and how it relates to a computer
- explain the advantages and disadvantages of cassette loading
- know how to care for a cassette recorder and cassette tapes

Vocabulary: cassette tape, cassette recorder, RAM, temporary memory, permanent memory

Motivation:

1. How many students listen to tapes?
2. How is a tape made?
3. Record a choral reading by the class on a tape and play it back for the class to hear.

Development:

1. What is the good of having the class choral speaking on tape? Elicit from class: So we can listen to it whenever we want. It is something we want to remember, etc.
2. There are cassettes you can buy which allow you to hear music and stories performed by others.
3. The cassette tape is a kind of memory. People have a memory also. How is the cassette tape memory different from a person's memory?
4. A computer has a memory also. It can hold a lot of information in its memory and it can retrieve information from its memory quickly.
5. The information is kept in RAM - Random Access Memory. RAM is temporary memory because when you turn the computer off or enter the command NEW, the memory is erased.
6. There are computer programs which you write which you may want to keep.
7. There are computer programs which you may want to buy to use in your computer.
8. These programs can be saved on cassettes and loaded into the computer any time in the future. The cassette provides permanent memory.
9. The advantages of cassettes are:
   a. You can save programs permanently
   b. Most computers will work with a cassette recorder

   c. The cassette is used as a storage device because it is relatively inexpensive

   d. The cassette recorder is relatively inexpensive

   e. Regular audio tapes can be used

10. The disadvantages are:

    a. Tapes are slow to record information from and play back into the computer

    b. It takes time for the computer to find the program you want on the tape because the tape must be run past everything recorded earlier. The computer cannot go directly to the program you request to be loaded.

    c. Tapes break easily

11. Special care must be given to the cassette recorder:

    a. Keep foreign matter out of the machine

    b. Do not touch either the tape or the record/play and erase heads

    c. Clean the heads with a head cleaning cassette

    d. Insert the tapes carefully and correctly to prevent damaging the machine

    e. Keep the recorder covered and dust free

12. Care of tapes:

    a. Store cassette tapes in their cases when not in use

    b. Keep in a dry spot out of the sun

    c. Keep away from magnetic fields

Applications:

1. Design a chart which illustrates the rules for caring for cassettes and cassette recorders.

2. Pretend you own a computer. Write a letter to a relative who wants to buy you a present to use with your computer, to persuade him or her to make that present a cassette recorder. Include all the reasons why this would be a good gift.

Summary:

1. Why are cassettes helpful to a computer programmer and to a computer user?
2. What are advantages and disadvantages of cassettes?
3. How do you take care of your cassette player and tape?

Assignment:

1. Why shouldn't a cassette tape be stored near a magnet?
2. Make a list of commercial programs on cassette that are available for your computer. For other computers.

TOPIC 19
How to Load and Save With Cassette Player and Tapes

Aim: How Do You Use a Cassette Recorder with a Computer to Store and Load Programs.

Performance Objectives: Students will be able to:

- load a program from a cassette into a computer
- save a program from the computer onto a cassette

Vocabulary: Load, Save

Motivation:

1. Have children observe the teacher loading a program from a cassette into the computer.
2. Run the program and then enter the command NEW.
3. Enter the RUN command and confirm that the program is no longer in the computer.
4. Observe the teacher reload the program.
5. Run the program again. Describe the results.
6. Ask the children how they could do what the teacher did. Elicit aim.

Development:

1. The cassette recorder and tapes:

   The cassette recorder is connected to the computer as described in the computer user's manual. Demonstrate.

   a. When a student records a program from the computer's memory onto his or her cassette tape, he or she is saving his or her program. (As the tape, coated with ferric oxide passes the record/play head, the program is saved on the cassette magnetically as a series of high-pitched sounds).

   b. When he or she plays the program back from the tape into the computer's memory, he or she is loading his or her program.

2. To keep track of what is on a tape, the students must make a list of all programs that they have recorded. (Since tapes are relatively inexpensive, each student can have his or her own cassette to record programs).

   If the machine has a counter, the students should also record the starting and ending number of each program.
   If the machine does not have a counter, some other method (e.g. markings on the window of the cassette itself) should be used to help determine the position of a program on the tape.

3. Students must advance the tape after each program. (They must not record programs too closely together.)

   This avoids overwriting a previously recorded program since the computer cannot check to see if a blank tape is being used.

4. Students should save their programs more than once.

   This practice will help to make sure students have a good recording of each program.

5. To load a program into the computer from cassette: (Set volume on recorder)

   a. Apple and Pet use the LOAD command

   b. IBM uses LOAD (CAS1:)

   c. Atari and TRS-80 use CLOAD

6. To save a program to cassette:

   a. Apple and Pet use SAVE command

   b. IBM uses SAVE (CAS1:)

   c. TRS-80 and Atari use CSAVE

Applications:

1. Teacher should demonstrate the saving and loading of program using a cassette recorder. Give children guided hands-on experience.

2. Write a program and type it into the computer. Save it on a cassette twice, at two different points on the tape. Turn the computer off or go to another computer. Turn that computer on and load the program into the computer.

3. Design a poster to be hung near the cassette player which illustrates the correct way in which the cassette player is hooked up to your computer.

Summary:

1. How do we load a program on cassette?

2. How do we save a program on cassette?

Assignment:

1. Make a list of the kinds of programs you would want to save on cassette.

2. You load a program from a cassette into your computer but cannot get the program displayed on the screen. List at least five things which might be wrong and how each may be corrected.

TOPIC 20
Disk Drive and Diskette Care

Aim: How are Diskettes Used with Computers?

Performance Objectives: Students will be able to:

- understand the functions of a disk drive and how it relates to a computer
- explain the advantages and disadvantages of diskettes
- know how to care for a disk drive and diskettes

Vocabulary: New: diskette, floppy, tracks, sector, format, magnetic
Review: RAM, temporary memory, permanent memory

Motivation:

1. Review the children's familiarity with recordings on tape. Ask with what other sources of recordings they are familiar. Elicit records which are played on phonographs.

2. Demonstrate the relationship of cassette tapes for sound recording and cassette tapes for computer recording to phonograph records for sound recording and diskettes for computer recording by showing a disk which has been removed from its protective sleeve. Note its similarity in appearance to a phonograph record.

Development:

1. Why bother to buy and use phonograph records? (So you can hear music or stories performed by your favorite singers or actors.)

2. The phonograph record is a kind of memory. People have a memory also. How is the phonograph record memory different from a person's memory?

3. A computer has a memory also. It can hold a lot of information in its memory and it can retrieve information from its memory quickly.

4. The information is kept in RAM - Random Access Memory. RAM is temporary memory because when you turn the computer off or enter the command NEW memory is erased.

5. There are computer programs that you write and may want to keep. (Ask for examples.)

6. There are computer programs that you may want to buy to use in your computer. (Ask for examples.)

7. These programs can be saved or purchased on diskettes and loaded into the computer any time in the future. The diskette provides permanent memory.

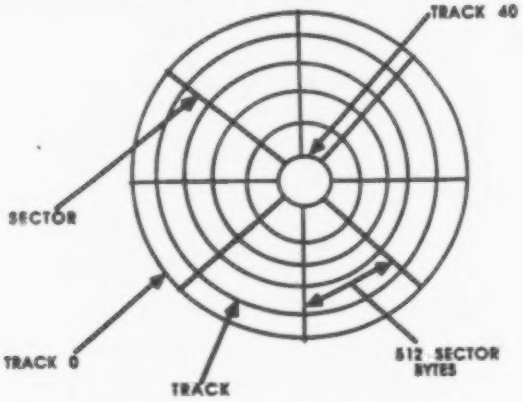
8. To load a diskette into the computer, a disk drive which is hooked up to the computer is used.

9. The disk drive may be encased with the computer as is the Radio Shack Model IV or may be a separate piece of hardware as in the Apple.

10. The drive spins a disk in the same way that a turntable spins a record.

11. The ones and zeros that computers use to process information, are stored by magnetizing tiny areas on the disk. This is done by the "read-write" heads that move back and forth across the spinning disk.

12. The disks are organized or formatted into sections made up of rings or tracks. This makes the speedy locating of information on the disk possible.



13. The advantages of disk drives and diskettes are:

    a. Disk drives are very easy to use once the proper commands are learned.

    b. Disk drives save and load programs much faster than tape recorders. They are also more reliable than cassettes.

    c. The disk automatically keeps a list (called a catalog or directory) of all programs that have been saved to it. Every program is saved with a name so the computer can easily set aside a place on the disk to store it and, subsequently, find it. Unlike working with the tape, you don't have to worry about the program's location on the diskette.

    d. A disk can save more programs on it than a tape can. Also there is no volume control to set.

14. The disadvantages are:

    a. Diskettes are a little more expensive to buy than tapes and can only be bought at stores that specialize in computers and accessories for computers.

    b. Each computer has a different way of formatting a disk. Formatting a new blank disk must be done before the computer can read or write to it.

    c. Each computer can only use commercial programs which are on disks specifically made for it, or made to be compatible with it.

15. Care of the disk drive:

    a. Do not insert any foreign matter into the drive.
    b. Keep the drive covered when not in use so dirt and dust don't get into the machine.
    c. Follow the correct start up procedures for that particular computer.
    d. When the drive is being used, any ventilation holes must not be covered or the drive might heat up.
    e. The read/write head of the drive must be kept clean. This can most easily be accomplished through the use of head cleaning diskettes.

16. Care of diskettes:

    a. Though they are called "floppies" they must not be bent.
    b. When they are not being used, they must be placed in their protective outer envelopes.
    c. Store in a dry place away from excessive heat or cold or any magnetic field.
    d. Store upright in a dustproof container.
    e. Touch only the jacket and not the magnetic recording surface of the disk itself.
    f. Since it is possible to ruin a disk, the students should make back-ups of their programs on a second disk.
    g. Only use a felt tipped pen, not a ball point pen, to write on the disk's label.

Applications:

1. Write a list of rules to be followed in caring for disks.
2. Write an essay in which you attempt to persuade a computer owner who has been using a cassette player to buy a disk drive.

Summary:

1. What is the relation of a disk drive to a diskette?
2. What are the advantages of a disk drive?
3. What are some advantages of disks over cassette tapes?
4. What are some disadvantages of diskettes?
5. How do you care for a disk drive and diskettes?

Assignments:

1. Draw a poster to illustrate the correct care of disks.
2. Organize a debate on the topic "All Computers Should Have Disks That Are Formatted Alike."
3. Investigate the effect of airport weapons detectors on disks you might carry on an airplane.

TOPIC 21
Disk Use - Formatting, Saving and Loading

Aim: How Do We Use a Disk Drive With a Computer to Store and Load Programs?

Performance Objectives: Students will be able to:

- know how to load and save programs from a diskette
- understand the process of formatting a diskette

Vocabulary: New: DOS, floppy, tracks, sectors
Review: disk drive, diskette

Motivation:

- How do we save a program on a cassette tape?
- How do we load a program from a cassette tape?
- Demonstrate loading a program from a disk.

Have children: Observe the teacher load a program from a disk
Run the program and enter the command NEW
Enter the RUN command and confirm that the program is no longer in the computer.
Observe the teacher reload the program.
Run the program again.

- Ask the children how they could do what the teacher did. Elicit Aim.

Development:

1. The disk drive and diskettes are storage devices that make a record of what is in the computer. Diskettes are also called floppy disks and the two words can be used interchangeably.
2. Programs may be stored on floppy disks which look something like 45 RPM records. They are thin disks coated with ferric oxide and are housed permanently in protective envelopes.
3. A floppy disk, which is either 3 1/2, 5 1/4 or 8 inches in diameter, still wearing its protective sleeve, is placed inside a disk drive, which may be built into the computer, like a TRS-80 or connected to it like an Apple computer.
4. The disk spins rapidly inside the drive. A read/write head moves across its surface through a slot in the protective envelope.
5. The head reads (or loads) data from the disk and writes (or saves) data to it.
6. Each computer has its own method for making a disk ready to accept data (format) and a method of inserting a disk into a drive.

7. Each disk must be formatted before information can be saved. Formatting is a process where the computer aligns the magnetic material into tracks and sectors so information can be saved. Sectors are subdivisions of tracks.

8. If the disk is inserted improperly, the drive or the disk could be damaged.

9. Do not open the door of the drive when the "in use" light is lit unless directed to do so by the manual.

10. If students save their programs on their own disks, they should write their names on the diskette with a soft-tipped pen so that they do not damage the disk.

11. To use the disk drive, a DOS (Disk Operating System) disk must be inserted into the drive. If it is a double disk drive, insert this disk into the zero or bottom drive.

12. You will be asked for the date: date MM/DD/YY.
    May 4, 1987 would be entered as: 05/04/87.

13. You will be asked for the time. Pressing the ENTER or RETURN key is sufficient.

14. When you see READY you may ask for the directory by typing DIR. or catalog. This will display the file names on the disk and how much empty space remains on the disk.

15. When you see READY you may load a program from the disk into the computer:

    TRS-80, Apple or IBM - type LOAD "file name"

    Pet - type DLOAD "file name"

    Atari - type LOAD "D:file name"

16. To save a program from the computer to a disk:

    TRS-80, Apple or IBM - type SAVE "file name"

    Pet - type DSAVE "file name"

    Atari - type SAVE "D:file name"

17. Demonstrate the loading of and saving on a disk.

Application:

1. Students save a program to disk.
2. Students load a program into the computer.
3. Students format a disk.
4. Students design a chart which illustrates the steps to be followed in loading, saving and formatting a disk.

Summary:

1. How do you load a program from a disk?
2. How do you save a program on a disk?
3. How do you format a disk?

Assignments:

1. Research to find the differences among the single density floppy disk, the double density floppy disk and the hard disk.
2. Define and illustrate on a diagram of a disk the following:

    the write-protect notch
    the centering hole
    the index-hole window
    the head access window
    the alignment notches

TOPIC 22
Computer Software

Aim: What Are the Differences Between Various Types of Computer Software?

Performance Objectives: Students should be able to:

- identify the major types of commercial software
- distinguish between hardware and software
- identify the criteria to consider before buying software
- list the rules of storing software safely

Vocabulary: software, hardware, word-processing, data-base management, electronic spreadsheet, operating system, RAM, ROM, peripherals.

Motivation:

Bring into class advertisements of different software packages and present them to the class and initiate a discussion. Pass around a cassette tape and a diskette and explain that these are the two major mediums of software.

Development:

1. What is meant by the terms software and hardware?

   a. Hardware is the term which is used to describe the computer and all peripheral equipment (drives, printer, interfaces).
   b. Software is the term which refers to the programs, i.e., instructions which direct the computer's operations. Software is usually stored magnetically either on cassette tape or on diskette.
   c. Commercial software is software developed by companies for sale.

2. What are the major kinds of commercial software?

   The major types of commercial software are:

   I. Recreational Software - this is software written to enable the computer to be used primarily for entertainment. The programs can be of almost any format and range from the maze type games to the more sophisticated adventure/fantasy games.

   II. Educational Software - this is software written to enable the computer to be used either to teach or to reinforce an educational principle or skill. Educational software packages have been written for almost every subject area imaginable.

   III. Word-Processing Software - this is software which is written to enable the computer to create, change and print any kind of written document that you wish. With a word-processing program your printed document appears first on the computer's screen where it can be revised until it is perfect. You can then print the document and even save it to use it at a later time.

IV. Data-base Management Software - this is software which is written to enable the computer to be used to store and retrieve data easily. With this type of software package the user can decide the way he/she wishes to organize the data and can retrieve it in any form desired.

V. Electronic Spreadsheet - this is software written to enable the computer to do a series of mathematical operations and display the results quickly. For example if school supplies cost $30 this year and prices increase at an annual rate of 5% - spreadsheet software could instantly tell me what supplies would cost each year for the next ten.

3. What things should be considered before buying any kind of software package?

As with any purchase, a consumer should shop carefully to ensure getting exactly what he wants for the most reasonable price. However with computer software the buyer should also take the following into account:

I. COMPATIBILITY - The software that you purchase must be compatible with the computer system that you are using. Compatibility means that the computer must have sufficient RAM memory to accommodate the program and the computer's operating system (the program that controls the computer's execution of a program) must be compatible with the software also.

II. USER-FRIENDLINESS - In order to utilize computer software it is not necessary to know a programming language. However some software packages are more difficult to use than others. The degree to which a software package is easy to use is referred to as user-friendliness. This "friendliness" is an extremely important feature and should be thoroughly investigated before any purchase is made. If a software package is not easy to use its value must be questioned. To insure "friendliness" ask for a demonstration of the software before making any purchase.

III. DOCUMENTATION - A software package should be well documented as well as user-friendly. Documentation refers to the user-manuals that explain how to access and utilize the different functions within a software package. Some important characteristics of good documentation are: clarity, conciseness and non-technicality.

4. What measures should be taken to protect software?
The following guidelines should be followed to protect software from accidental damage and destruction:

a. When handling the diskette touch only the plastic jacket. Never touch the magnetic recording surface in the center.

b. Push the diskette all the way into the drive before attempting to close the drive door.

c. When not in use keep diskettes in protective envelopes.

d. Never insert or remove diskettes while the drive is in operation.

e. Never bend a diskette.

f. Store diskettes in a dry place away from excessive heat or cold and away from a magnetic field.

g. Since diskettes are easily damaged, make many back-up copies of the software to protect against loss of the original.

h. When not using cassette tapes, keep them in protective cases to prevent accidental damage.

i. Keep cassettes in a dry place out of the sunlight.

Activities:

1. Ask students to collect newspaper and magazine advertisements for software packages. As a class discuss each advertisement submitted and categorize the software as educational, recreational, data-base, electronic spreadsheet or word-processing.

2. Ask students to develop a checklist to rate software packages. If there is software available in the classroom evaluate it.

3. Have students make classroom posters indicating the precautions which should be taken to keep the software safe from harm.

4. Have students play "software shopper". Give each students an imaginary $400 to spend on software. Have students shop via newspaper and magazine ads, visits to local computer stores and report back to class as to what they "bought" with their money.

Social

Task Cards Used in This Unit

Topic 23	Social 1-4
Topic 24	Social 5
Topic 25	Social 6-8
Topic 26	Social 9-12
Topic 27	Social 13-15
Topic 28	Social 16,17
Topic 29	Social 18-21
Topic 30	Social 22
Topic 31	Social 23-27
Topic 32	Social 28-31
Topic 33	Social 32-35
Topic 34	Social 36-41
Topic 35	Social 42-47

TOPIC 23
Computers at Home

Aim: How Can Computers Be Used In Our Homes?

Performance Objectives: Students will be able to:

- define specific terms
- describe the computer as a communicator in the home
- describe the computer as a processor of information
- list at least 5 reasons for using a computer at home

Vocabulary: communication; data; process; processor; compu-serve; data-base

Materials:

2 telephones (or toy phones)

Motivation:

Have children role-play a situation where a home telephone caller is trying to receive some kind of information over the phone from the other person. (for example - caller may be calling a movie theater for the show time of a particular film; caller may be calling weather bureau; etc.)

Discuss with the others the scene they would have just witnessed. Get them to realize and understand that it was more than just a phone conversation - the caller had a PURPOSE, and that was to get INFORMATION.

The means of COMMUNICATION used here was the telephone.
"Where was the caller most likely calling from?" (his home).

The COMPUTER can also be used as a tool in getting information to us quickly right in the CONVENIENCE of our own homes.

Development:

1. Tell the children that the computer can be LINKED UP to a telephone and can communicate with another bigger computer in this way.

2. Tell the children that the home computer receives and processes information from the main computer it is hooked up to right over the phone. One service of this kind is known as "COMPU-SERVE." The information contained in the main computer is called DATA BASE.

3. LIST the following examples of information people may be interested in getting from a service like COMPU-SERVE on the board:

stock market reports
news
weather
time

4. Computers can also be used as a household tool in:

   a) filing family's favorite recipes
   b) managing finances
   c) balancing checkbooks
   d) educating (assist in doing homework, writing papers, studying)
   e) playing video games

Summary:

The computer can be used as a household tool in either obtaining or storing information for family's use.

Follow-Up Activities:

1. Children can find pictures of other means of communication, particularly those used in the home and then prepare a scrapbook or collage.

2. Have children role-play a salesman trying to persuade a family to buy a home computer.

3. Children may draw ads or create commercials for a service like "Compu-Serve."

4. Present the children with this situation: "You have just won a personal home computer in a contest! But we cannot let you have the computer until you can convince us that it will be put to good use in your home."

   Write the company a letter explaining your reasons for wanting this computer in your home and where you would put it.

5. TASK CARD - In the computer age, computer video games are quite popular, and children ARE NOT the only ones playing. The list below features video games that have not yet hit the market. Look them over. If you could CHOOSE one game to play, which one would you try out? Explain the RULES and PROCEDURES belonging to the game and DESCRIBE details using words or pictures.

   PILLOW FIGHT
   ZILCH!!
   BUFFALO BLOCKADE
   GONE BANANAS!
   ON THE WATERFRONT
   ICE CREAM INVADERS
   MISSION IMPOSSIBLE
   DRAGON DEMONS
   VOLCANO VACUUM
   WOW!!
   ELEPHANT KONG
   GHOST HUNT

6. General Questions: What qualities must a video game have to appeal to you? What are some of your favorites? What makes those your favorites?

7. Children can take a survey of salesmen in stores that sell home computers and interview them to find out the most popular reasons why people buy computers for their homes. Children can compare their results and perhaps illustrate them on a bar graph.

TOPIC 24
Computers at School

Aim: How Can The Computer Be A Helpful Tool Used In Our Schools?

Performance Objectives: The students will be able to:

- identify 4 different locations in a school building where computers may be utilized to facilitate staff work
- explain reasons for using the computer in each of these rooms
- describe ways in which the computer can enrich them as students

Motivation:

Ask the children to name "tools" used in the classroom everyday. (pens, pencils, board, maps, rulers, books, etc.)

If "computer" is a given answer, ask the child why he/she gave that response. If it is not given as an answer, you bring it to the children's attention: "Would you consider the computer to be a classroom tool? Could we find ways to use it almost every day in our class?

Development:

1. Form a chart or list with the children.

IN THE CLASSROOM: Helps Teachers With:
- a) Making general class lists
- b) Testing/evaluating children's work, recording marks/grades
- c) Preparing lessons
- d) Drill and practice materials
- e) Word processing

Helps Students With:
- a) Keeping their own records of progress
- b) Averaging of test scores
- c) Educational activity cards and games in various subject areas
- d) Extra-credit work
- e) Sentence structure
- f) Writing poetry
- g) Forming paragraphs
- h) Solving mathematical problems

2. Where else in the school might a computer be put to use?

3. Continue chart:

MAIN OFFICE:
- a) Health records
- b) General record information (child's name, address, phone number, parent's name)
- c) Scheduling and setting up new classes
- d) Telephone link-up with Board of Education
- e) Teacher pay-roll

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LIBRARY:	a)	Checking out borrowed books
	b)	Catalog and filing system
CAFETERIA:	a)	Keeping lists of children enrolled in lunch program
	b)	File popular lunch menus

Follow-Up Activities:

1. Situation: Their school is interested in purchasing computers for the classes and other rooms. The following group of people are highly in favor of this idea:

The principal - wants his/her students to get the best education possible; wants to gain recognition in the district.

The students - think it will be fun to "play" with.

The secretaries - want their job to be made easier; they're tired of piles of paperwork on their desks.

The computer salesperson - wants to sell as many computers as he/she can; concerned about commission, not children.

The following people are against this idea:

Some parents - mothers and fathers who don't know much about computers and are afraid of them - consider them to be a waste of time and think their kids won't learn anything.

Many teachers - have never used computers and fear them; afraid they will lose their jobs to computers; uncomfortable with the subject and don't know how to teach it.

District Superintendent - Also fears computers; has no experience with them - doesn't know "what will happen" to his/her schools.

Tell the children that these two groups of people have arranged an after-school meeting to discuss the issue. Have children role-play their parts and try to reach some kind of decision based on what each person speaks about at the meeting. The children who are not involved in the meeting will be the judges.

2. Not every school has a computer. Do you feel lucky and privileged to be able to have at least one in your school? Explain why you feel the way you do.

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3. CREATIVE WRITING: This could be on an activity card.

Your parents are constantly nagging you because "you're always locked up in your room playing with that stupid, worthless thing all day. Your mind is going to waste."

Of course, that "stupid, worthless thing" is the computer that grandma and grandpa got you for your birthday.

Instead of slamming your door, or ignoring your parents, perhaps you could convince them that the computer has educational value to you.

How would you do this? Write about what you would tell your parents to persuade them to like the computer and how you would get them to UNDERSTAND that your mind can benefit from using a computer.

Perhaps you can teach your parents how to use it!

TOPIC 25
Computers in Society

Aim: How Are Computers Used In Our Society?

Performance Objectives: The students will be able to:

- list familiar organizations in our society that use computers
- identify items evidencing use of computers in these places
- describe our society as one that makes good and abundant use of computers

Materials: As many of the following items as possible:

computer printed grocery receipt
computer printed phone/utility bill
credit card
airline ticket
concert ticket
bank teller window receipt
ads for computer appliances
digital watch
computer magazines
punch cards

Motivation:

Ask the students to imagine a spaceship from another planet landing on earth. Two creatures come out and begin exploring the earth. Imagine all they find is a box containing the above items. (Take out box of items.) They begin examining the materials. Let's look at what's in the box.

Development:

1. Have children identify the items. Discuss where they have seen the materials and who might possess them.

2. Ask the children how the aliens can use these items as CLUES to the way people on this planet (Earth) live.

What can the aliens learn about us and our lives based on these items? (the jobs we hold, entertainment we like, our personalities, our intelligence, etc.) What conclusions might the aliens make about this thing called "computer?"

3. Form a list or elicit from the class, a list of organizations in our society where the use of computers is important to the function of that place:

Stores
Banks
Industry-factories
Other Businesses
Telephone Company
Hospitals
Libraries
NASA - communication satellites
Airports
Computer-dating services

Follow-up Activities:

1. Class trips to any of the above places.
2. Collage or scrapbook of computerized items.
3. Choose someone who is not living in our society as it is today. (A famous person from the past.) How do you think this person would react to computers if he/she were alive today? How do you think this person might have benefitted from using a computer in his/her life?

Example: Martin Luther King might have used a computer to help him write his speeches.

4. Can you solve this riddle?
"How did the bride and groom computers who just got married first meet each other?"

(Through COMPUTER DATING!!)

TOPIC 26
Careers With Computers

Aim: How Are Computers Used In Careers?

Performance Objectives: Students will be able to:

- . describe careers involving computers
- . understand and become aware of the job opportunities available to them involving the computer

Materials:

10 classified ads (at least) featuring jobs available for people who must be highly skilled with or have at least some knowledge of computers, posted on oaktag. Highlight the skills required with a yellow marker.

Motivation:

Hold a discussion about what the children would like to do with their lives in terms of a career.

> "What choices do you have?
> How does one decide on a career?
> Do you have to make a decision right now?
> Should you start thinking about this now, or do you think you should wait?"
> What is your opinion of computer as a career?
> What careers involve the use of computers?"

Development:

1. Show the children the posted ads. Read one or two of them to the children, emphasizing`the computer skills necessary for the job. Discuss each one. You might come across a few special terms like these: programmer; word processor; analyst; keypunch operator; technician; use them as VOCABULARY words.

   Then have the children read aloud individual ads from the poster. End the discussions with the following:

   "What can you conclude about the relationship between the computer field and job opportunities in New York City?" (assuming the ads are from New York newspapers.)

   "Do the ads open doors for you in terms of future job opportunities?"

2. Ask the children how computers might be utilized in the careers they are interested in. Children may illustrate and label for bulletin boards scenes of themselves seated at a computer in their future careers.

Follow-up Activities:

1. Research project: The Effect Of Computers On The Job Market
2. Students can conduct INTERVIEWS with workers in various businesses finding out how their jobs have been affected by the computer.
3. Role-play: Students can act out a person applying for a job with computers during his/her interview. The interviewer should focus mainly on the applicant's interest in computers and experience.

TOPIC 27

The Computer as a Problem Solver

Aim: How Does A Computer Help Us In Solving Problems?

Performance Objectives: Students will be able to:

- understand that a computer is a tool that can help people think
- recognize the limitations of a computer in problem solving
- appreciate the unique capabilities of a computer

Vocabulary: New: program, data base, simulation, tool

Motivation:

Tie a number of books together so that the load is heavy. Ask a child to lift it. Now place the books on one end of a lever (a large board with a chair as a fulcrum). Ask the child to lift books with the aid of a lever.

Which was the easier way to lift the books? Why?

Establish the concept that there are tools to help people with problems.

Development:

1. The lever in our experiment is a tool to help people work with their muscles. Name some other tools that make physical work easier.

2. The computer is a tool that has been designed to help people use their ability to think.

3. The computer without a human being to use it, is like a drill, an automobile or a nail file without anyone using it. Each accomplishes nothing without a human being but each helps a human accomplish things more easily and more quickly.

4. People must tell computers exactly what to do and how to do it.

5. Computers are 100 per cent obedient but very "stupid". They know nothing except what a human has told them. They must be told exactly what to do, in detail.

   They must be told the exact order in which to do each thing.

   They cannot figure out what you write by sounding it out (like your teacher can - teachers are so smart!). Everything you tell the computer to do must be spelled exactly right.

6. Instructions to the computer are written as programs. Programs are written in a computer language. They must be written correctly for the computer to operate.

7. Since a computer always follows the instructions, it doesn't make mistakes. "Computer Error" is really "Programmer Error".

8. Computers can do things very fast. Its speed is one of its most important assets. It can do thousands of arithmetic examples in a blink of an eye.

9. Computer memory can store and recall thousands of facts instantaneously.

10. Computers can repeat a series of steps over and over without errors.

11. Computers can compare and sort information based on the data and instructions given to it.

12. Computers can show many possible outcomes based on different combinations of data.

13. Mathematical computation, data base utilization, and simulation design are computer applications which assist humans in problem solving.

Applications:

1. Describe a situation in which the computer's mathematical capabilities would be preferred to a human's.

2. Describe a situation in which the speed of a computer's recall of stored memory would be of great help in problem solving.

3. Write a list of instructions for "a man from Mars" to tell him how to brush his teeth. Include every detail and be certain to place each step in its correct order.

Summary:

1. What qualities of a computer make it an outstanding problem-solving tool?

2. What role must a human being play in making a computer useful?

3. What tasks could we not expect a computer to do?

Exercises:

1. People blame computers for many mistakes. Plan an advertising campaign using posters, slogans and jingles which will tell the public about the good things computers can do.

2. Very complicated problems can be broken down into simple parts. Think of a problem you have. Explain it to a computer, step by step, in a logical order.

TOPIC 28
Computer Ethics - What's Right?

Aim: What Is Computer Ethics?

Performance Objectives: Students will be able to:

- . state the correct uses of computers in our society
- . identify incorrect uses of computers in our society
- . recognize the need for special security on certain computer systems
- . recognize the dangers computers can place on the world

Vocabulary: New: hacker, tourists, crashers, data banks, ethics

Motivation:

Discuss the movie "War Games."

Did the students have the right to break into the school computer and change their grades?

Did the students have the right to break into other computers to steal information?

What are the consequences?

Development:

1. What does ethics mean? (the discipline dealing with what is good and bad and with moral duty and obligation; the principles of conduct governing an individual or group)

2. Elicit from students how computers are used to help us:

   - solve problems
   - keep track of information
   - play games

3. What are data banks? (Data banks are large computer systems that store large amounts of information.) Government agencies, hospitals, businesses, schools, credit bureaus, banks and social agencies maintain data banks.

4. Who owns the data in a data bank? The person who collected it or the person whom the data describes?

5. What is crime? Stealing, murder etc.

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6. What is computer crime? What are some examples?
   - Software which belongs to the programmer, publisher or computer manufacturer can be copied.
   - With proper equipment, people can spy on long distance telephone calls that are sent via satellite.
   - Messages sent from one computer to another can be intercepted and used for stealing business secrets, research data, marketing plans, etc.
   - Information in data banks can be stolen or changed.
   - Money can be taken from someone else's bank account.

7. Computer criminals
   - Hackers are people who break into other people's computers.
   - Tourists are people who penetrate computer systems just to look without disturbing the data.
   - Crashers will erase or change files causing massive disruption to a business or a governement agency and, of course, to the individuals whose records are changed.

8. Invasion of privacy.
   Information about how you spend your money
   what magazines you read
   what medicines you take etc.
   can be found in data banks and can be sold to interested parties or accessed by the government.

9. The Privacy Act of 1974, an amendment to the Freedom of Information Act and the Freedom of Information Act itself are pieces of legislation which can help to protect people from some misuse of computer information.

Application:

1. Have students list ways in which computer crime can affect their lives.

2. Have students list ways in which the misuse of computer information can affect their lives.

Summary:

1. How does what's "right" in everyday life compare to what's "right" with computer use?

2. How are our lives affected by unethical computer practices?

Assignments:

1. Have students list ways to stop computer crime.

2. What new laws are necessary to prevent computer crime?

3. What should the punishment be for committing a computer crime?

TOPIC 29
Advantages To Business and Government

Aim: What Are The Advantages Of Computers To Business And Government?

Performance Objectives: Students will be able to:

- explain how government and business can benefit from computer use
- explain the types of tasks computers are used for
- suggest possible future uses of computers
- explain the tasks computers perform

Vocabulary: New: UPC universal code, retrieval, data processing, process control, simulation, productivity, espionage

Motivation:

List some electronic devices that are part of your life.

- digital watch
- touchtone phone
- calculator
- television with electronic tuning
- microwave oven
- cash register
- computer

How are these things related to computers?

How have electronic devices improved our lives?

- speed of obtaining results
- ability to accomplish more work
- improved accuracy
- improved efficiency

Development:

1. What are the tasks that computers perform?

    - Retrieval - getting information back that is already input: checking your balance in a bank account.

    - Data Processing - taking data and doing something with it: adding numbers together

    - Process control - regulating certain situations: a thermostat checks the temperature and turns on heat or air conditioning

- Simulation - imitating a real life situation on the computer in order to find the best solution: engineers in space program simulate different courses for the space ship in order to find the best one; farmers run simulation programs to learn what effect the use of fertilizers, pesticides, irrigation and planting time will have on their crops.

2. What improvements have there been?

   - Physical size is down
   - Speed and memory are up and their cost is down.
   - Scientists are now even using computers to design new computers which are smaller and faster.

3. How are computers used in the business world and why?

   - Payroll
   - Inventory
   - Employee records
   - Research
   - Marketing strategy
   - Electronic mail
   - Word processing
   - Message systems
   - Factory robots
   - Banking
   - Airline bookings
   - Real estate inquiries

4. Examples of computer use in the business world:

   - Supermarkets - UPC code.
   - Factories - robots.
   - Banks - savings accounts, checking accounts, loan payments, calculating interest, credit history.
   - Utility companies - calculating how much utility is used, figuring the price, printing bills, monitoring payments, projecting future needs and peak periods.
   - Lending companies - credit history, checking employment and income, monitoring payments, figuring interest, deciding if you are a good risk.

5. How does the government use computers?

   - The census
   - Tax collection - Internal Revenue Service
   - Secrets - military, espionage
   - Defense - missiles, aircraft, ships, simulate attacks and defense plans
   - Personal records of civilian employees and military personnel
   - Train astronauts in the space program flight simulators
   - Collect information from space voyages

- Criminal records and investigation
- Distribution of money such as tax refunds, Social Security payments, Medicare
- Local governments, car registration and license, traffic control, wanted persons, stolen property
- Investigation - voice prints, lie detector, fingerprinting records

6. What tasks in the future do you see computers used for that can affect you?

    - Do all shopping by computer
    - Read electronic newspapers, weather reports
    - Have the movie sent to you by cable to your TV
    - Take courses via computer

Applications:

1. Explain the advantages of using computers in the following:

    - secretary using a word processing machine
    - investigators at the FBI
    - using electronic mail in the office
    - an employee in a fast food restaurant taking a large order
    - an owner of a gas station
    - a shopper in a department store waiting on line to pay
    - making a deposit to your savings account
    - the space program
    - weather forecasting

2. Describe the type of activity the computer is used for in each of the above (retrieval, processing, process control, simulation, word processing).

Summary:

1. What are the benefits of using computers in business and the government?

2. Who benefits from them?

3. What are the capabilities of computers that make them good for these uses?

Assignments:

1. How does business improve productivity by using computers? Give some examples.

2. How does government use computers to run a more efficient operation? Give examples.

3. Are people losing jobs because of computers?

TOPIC 30
Advantages to Organized Sports and to the Creative Arts

Aim: What Are The Advantages Of Computers To Organized Sports And Creative Arts?

Performance Objectives: Students will be able to:

- explain how organized sports and creative arts can benefit from computer use
- explain the tasks computers perform
- understand word processing

Vocabulary: New: creative, word processing, statistics, manipulate

Motivation:

How have electronic devices improved our lives? (Such as calculator, digital watch, etc.)

- speed of obtaining results
- ability to accomplish more work
- improved accuracy
- improved efficiency

Development:

1. Review - what are the tasks that computers perform?

    - Retrieval - getting information back that is already input: checking your balance in a bank account

    - Data Processing - taking data and doing something with it: adding numbers together

    - Process control - regulating certain situations: a thermostat checks the temperature and turns on heat or air conditioning

    - Simulation - imitating a real life situation on the computer in order to find the best solution: engineers in space program simulate different courses for the space ship in order to find the best one.

2. How can computers be used in organized sports?

    - scheduling of games

    - keeping records and statistics

    - computer simulations for training athletes

    - keeping inventory on equipment

    - payroll of athletes

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- Olympic games for scoring purposes

- recording time in races

3. What are creative art areas?

   - Dance
   - Drama
   - Music
   - Art
   - Creative Writing
   - Theater
   - Movies

4. How can computers be used in creative arts?

   - Creative Writing and Drama - Use word processing program (for example, Bank Street Writer) to keep track of texts and creative writing. Word processing uses a computer to manipulate words or written material. A word processor is a computer program that makes it easier to type, revise, store, retrieve and print text.

   - Art - Computers can be used for animation, drawing and sketching. Another way is to use a Koala Pad for drawing and having it processed by the computer. High resolution plotters can draw points and lines in more than 10,000 by 10,000 positions. Repetitive designs are easily drawn by a computer on a high resolution plotter.

   - Music - Speech synthesizers have been connected to computers to create musical notes. E.g., Radio Shack's Dancing Demon program allows students to create their own musical notes and dance routines. Computer based music systems use a piano style keyboard as the input device. Computer memory stores the notes and intervals between notes. The processor can modify the notes, rhythm and speed.

   - Theater - Stage lighting is an important part of a play. Lighting can be controlled by instructions to a computer. Each change in lighting is put into the computer's memory and as the action of the play changes the operator has the computer change the lights according to the instructions already programmed for that part. The same lighting pattern is used at each performance.

   - Movies - Special effects are often easier and cheaper to create with computer programs than to build sets and props.

     Movie robots in the form of space creatures or prehistoric animals are controlled by computers.
     Cameras mounted on mechanical arms are controlled by computers. A computer program tells the arm how to move and turn.

   - Dance - Choreographers can simulate their dance patterns on a computer to visualize and alter the dance steps before introducing them to dancers.

Application:

1. Have the students break up into groups to find other uses of computers in organized sports and creative arts.

2. Explain the advantages of using computers in the following situations:

    Runners in the New York City Marathon wear chest tags with UPC codes on them
    Sports commentator broadcasting a Met game
    The Giants and Jets share the same football stadium
    A boxer is preparing for a championship match
    The Yankees prepare for a road trip
    Time for the pro-football draft
    A theatrical lighting designer must work on three shows at the same time
    A writer is doing research for a novel set during the Civil War
    A dramatist is working on his newest play
    A commercial is being made for TV
    A new video game is being developed

    Describe the type of activity the computer is used for in each of the above (retrieval, processing, process control, simulation, word processing.)

Summary:

1. Name some of the ways that computers are used and can be used in organized sports and creative arts.

2. What are the benefits of these uses?

Assignment:

1. How can we get more computers to be used in our school for creative arts?

2. Investigate the possibility of the local Little League purchasing a computer. What could it be used for?

TOPIC 31
Advantages in Education and in Medicine and Law

Aim: How Are Computers Used in the Fields of Education, Law, and Medicine?

Performance Objectives: Students will be able to:

- explain how computers are used in education, law, and medicine
- understand the terminology of CAI and CMI
- suggest possible future uses of computers in education
- recognize different computer languages

Vocabulary: New: CAI (Computer Assisted Instruction), CMI (Computer Management Instruction), LOGO, BASIC

Motivation:

How are your New York City reading and math tests marked?

Do the police use computers? For what reasons?

- keeping track of criminals
- solving crimes
- payroll
- inventory of weapons

Development:

1. Review - what are the tasks that computers perform?

   - Retrieval - getting information back that is already input: checking your balance in a bank account.

   - Data Processing - taking data and doing something with it: adding numbers together.

   - Process control - regulating certain siuations: a thermostat checks the temperature and turns on heat or air conditioning.

   - Simulation - imitating a real life situation on the computer in order to find the best solution : engineers in the space program simulate different courses for the space ship in order to find the best one.

2. How are computers used in the field of law?

   - legal research
   - records
   - law enforcement - e.g., radar detection for speeding, exchange of criminal photos by computer printouts
   - investigation: voiceprints, lie detector, fingerprint records
   - correspondence - word processing

The advantages are that computers move information faster and more accurately.

3. How are computers used in the field of medicine?

   - specialists can be in one location and treat patients in other locations
   - hospitals - intensive care units monitor body functions, heart rate, blood pressure, temperature, blood analysis, patient medical history
   - medical diagnosis - e.g., CAT scan
   - preventive medicine
   - research - to keep records and look for new cures for diseases
   - medical records
   - billing and inventory
   - correspondence - word processing

   The advantages are that computers make the job more accurate and efficient.

4. How are computers used in the education field?

   - Learning from computers (CAI - Computer Assisted Instruction) Drill and practice tutorial

   - Learning with computers

   - Simulations - enhancing life experiences

   - Games - developing strategies

   - Learning about computers

   - Computer literacy and awareness

   - Programming languages

   - Word processing

   - Learning about thinking with computers

   - LOGO - computer language that goes from simple to more complex thinking

   - BASIC - Beginners All-Purpose Symbolic Instruction Code

   - Managing learning with computers

   - CMI - Computer Managed Instruction

- Attendance

- Test generators

- Budget

- Scheduling of classes

- Communication network between schools

- Diagnostic and prescription for learning

- Inventory of student records

Applications:

Explain the advantage of using computers in the following situations:

- your school's attendance officer
- your teacher has to mark 123 exams
- a student practicing math examples
- a hospital patient who needs to have his breath analyzed for proper amounts of oxygen
- a lawyer is preparing a case in defense of his client
- a patient describes a series of unusual symptoms to his doctor
- a doctor must decide which of several available medicines to prescribe for his patient
- the Heat Complaint Bureau gets a call from a tenant in an apartment house
- tax laws are changed every year

Describe the type of activity the computer is used for in each of the above (retrieval, processing, process control, simulation.)

Summary:

1. What are advantages of using computers in the medicine field?

2. What are advantages of using computers in the law field?

3. What are advantages of using computers in education?

Assignment:

1. Write an editorial discussing the need for future uses of computers in our school. Support your stand by describing what benefits students, teachers and administrators would gain.

2. Interview an attorney or physician to find out how he or she is using computers, and his or her plans for using computers in the future.

TOPIC 32
Computer Disadvantages - Privacy and Criminality

Aim: How Are Computers Sometimes Used in Illegal Ways?

Performance Objectives: Students will be able to:

- define a data bank (base)
- outline the process in which a computer accesses a data base
- explain how data bases can possibly be used to violate privacy
- explain other crimes associated with unlawfully accessing a data base

Vocabulary: data base, data bank, access, hacker, crasher, tourist, modem, criminal, civil, mainframe.

Motivation:

Narrate the following story to the class:

Twenty-six students from the California Institute of Technology took the McDonalds Corporation at their word and entered a contest as often as they wanted to. All a contestant had to do was fill out an entry blank or submit a 3x5 inch piece of paper with their name printed on it. The students, in fact, submitted 1.2 million entries consisting of 3x5 inch card with their name and address printed on it. The enterprising students used the school's computer and programmed it to simply print out the 3x5 inch entries. The students then stuffed the entries into the entry bins all over the area. Since these entries represented 33% of those submitted, the students won a large share of the awarded prizes. Although McDonald's felt that the students violated the spirit of the contest, they begrudgingly awarded the prizes.

Begin lesson by getting students to respond to this event. Was it fair for the students to have done this? Even if they didn't break any of the rules, should they receive the prizes? What does this kind of incident tell us about what can be done with computer technology?

Development:

1. What is a data base and how is it used by a computer?

Data is information - it is numbers, dates, heights, addresses, bank balances - whatever, it's all data. From the moment we are born we begin to generate data. For example, your name and date of birth are data items which are most likely stored in the data bank used by the hospital's computer. (A data bank or data base is a systematic electronic storage of information that can be accessed by a computer.) If the hospital you were born in wished to find out your date of birth they could simply use their computer to search through the data base to find your name and then print out your date of birth as well as any other data they have on you.

At this very moment, your name appears on many different data bases. For example, all children that are registered in the NYC public school system have their names, addresses and ID numbers on a data base. If you have a bank account or if you have a Social Security number, you are part of other data bases. As you get older and your life becomes more complicated with jobs, taxes and credit cards, the number of data bases that your name appears on will increase tremendously. Data bases are and will continue to be very much a part of the modern computerized world. Problems arise when people attempt to in some way abuse these collections of information.

2. How can data bases be misused?

Mainframe computers are the large computers that handle millions and millions of pieces of data. Mainframes are used by large corporations, hospitals, schools or any other kind of large organization. These mainframes maintain databases which are regularly accessed by employees who may be working quite a distance from the mainframe. The data is transmitted and received over the telephone lines. This procedure permits authorized users to gain access to the database for analysis or update. Because this system was designed to make it easy for the authorized user to access the database, problems occur because unauthorized users attempt to access the same databases.

3. How do unauthorized users gain access to data bases?

The problem of unauthorized users gaining access to data bases or "getting into" a computer system has grown tremendously as the number of microcomputers has grown. A microcomputer equipped with a modem (a device for transmitting and receiving data via the telephone lines), communication software and a telephone is capable of communicating with a mainframe and accessing its data base.

Once a user secures the correct telephone number of the mainframe, he can dial the computer and then gain access to the computer by using a combination of the correct passwords and codes. Passwords and codes are supposed to be kept secret but sometimes lax security enables them to be attained quite easily. For example, in one case the unauthorized users learned the codes and passwords by getting computer printouts out of the firm's dumpster; the codes and passwords were clearly printed on these runs. Another method used by unauthorized users is simply to "hack" it out -that is to simply try different words and combinations until they hit upon the correct one. People who do this are known as "hackers".

4. What kind of crimes are committed by people who illegally gain entry to computer systems?

The crimes that are committed by people who gain illegal access to computer systems fall into one of the following categories:

1. Trespassing - Gaining illegal access to a computer data base is as wrong as gaining illegal access to someone's property. It is trespassing - being where you don't belong.

2. Violation of Privacy - Each citizen in the U.S. has a constitutional guarantee to privacy. Unauthorized users who gain access to data bases to simply look around, the "tourists" as they are called, are violating the right to privacy of the people whose data they illegally review.

3. Vandalism - Unauthorized users that gain access to a computer system and destroy records, the "crashers" as they are called, are guilty of the crime of vandalism .

4. Larceny and Forgery - Unauthorized users who gain access to a system and profit by changing data may be guilty of both larceny and forgery.

All of the above could have both criminal and civil results on the unauthorized user.

5. What other kinds of problems have developed as a result of the increase in the number of data bases ?

The net effect of the large increase in the number of computerized data bases is that there is so much information available on each one of us that there is a resultant loss of privacy. By accessing different data bases it is possible, legally, to find out information about someone's health, educational achievement, credit history and even buying habits. Because this information is so easily available people to some degree feel that part of their privacy has been taken from them.

Activities:

1. Attempt to do some clarification of values with the class. Have students do some role-playing. Give volunteers roles to play - the hacker, the tourist, the crasher, the victim. Have students interact in these roles and have other class members respond to the attitudes of the role players.

2. Language Arts Related Activity - Have students write a short story entitled, "The Boy Who Never Was". The basic plot would be that this boy does not exist any more because his name and other data about him has mysteriously disappeared from all data bases.

3. Social Studies Related Activity - Teach the criminal justice system by having a mock trial of a "hacker". Students could be chosen to represent the various court officials and expert witnesses such as "tourists" and "crashers".

4. Have students create "WANTED" posters. Each poster should have a description of the kind of computer-related criminal behavior to be looking out for.

5. Have students make a list of all the data bases they think their names may appear on. Expand the list to include the data bases that their parents' names may appear on.

TOPIC 33
Computer Disadvantages - Job Security

Aim: How Are Computers Eliminating Certain Kinds of Jobs?

Performance Objectives: Students should be able to:

- define technology
- explain how improved technology sometimes causes unemployment
- explain why computer use is increasing daily
- list the kinds of jobs computers are likely to replace

Vocabulary: technology, unemployment, generations, computer technology, electronic mail, ENIAC, microchip, automation.

Motivation:

Bring to class the Sunday newspaper's employment ads and initiate a discussion of their purpose. Students will most likely be impressed with the number of positions available. Point out that in all the hundred of ads we don't see ads for blacksmiths, ice men, chimney sweeps or boiler stokers. Explain that jobs such as this have been replaced by machinery. Discuss what kind of machinery has replaced each of the examples.

Development:

1. What is meant by technology?

Technology refers to the application of scientific principles to solve practical problems. In other words we now use machinery to do the work that men and women used to do. The automobile, the wheel and the pulley are examples of technology.

Technology has both positive and negative effects on society. Technology helps mankind by making life easier, but on the negative side technology often results in some people losing their jobs. Refrigerators did away with the need for ice men just as dishwashing machines replaced dishwashers.

2. Why is computer technology increasing at such a rapid pace?

Computer technology i.e., the application of the principles of computer science to solve practical problems, is expanding every day. Since the first electronic computer (ENIAC) was introduced in 1946 by John Mauchley and Presper Eckert, the history of computers has been one of increasing speed and diminishing size and costs. With the development of the integrated circuit chip, the microchip, in the 1970's, computers have become much smaller and much less expensive. The result of this has been a dramatic increase in the number of computers in use in our society. In 1980 there were about 700,000 computers in use. By the end of 1983, there were approximately 13,000,000 in use.

3. What kinds of tasks are computers good for?

People can do anything computers can do. In fact people out-perform computers in most sophisticated decision-making processes. The only advantage that computers have over people is their incredible speed. Mathematical operations, sorting, selecting, transmitting and receiving data, printing and certain kinds of decisions - these are the tasks computers can do very quickly.

4. What kinds of jobs will be affected by the increasing use of computer technology?

People who have jobs which can be done more efficiently by a computer will be the most directly affected by the increased use of computer technology. For example, the position of file clerk may disappear since a computer can do electronic filing much more efficiently. A computer with a data-base management software package could eliminate the need for an entire department.

A computer system equipped with electronic SPREADSHEET software could eliminate the jobs of many bookkeepers and automatic teller machines have substantially reduced the need for human tellers. The coming of what has been called "electronic mail" - the transfer of messages via computer terminals - may threaten the survival of the mail clerk's job.

Computer technology has even entered industry. More and more industries are using computer operated robotic arms to relieve workers of many monotonous and sometimes dangerous tasks. For example robotic arms are now routinely used to put goods in cartons, paint cars and remove products from furnaces.

With the use of computer technology, work is being completed much more efficiently than ever before. Unfortunately this efficiency means that people lose jobs. Office workers no longer have to spend hours retyping letters for the boss because word processors remember and can reproduce the document at will. However, as a consequence, the demand for typists has been reduced. The newspaper industry can produce the paper without setting type - computerized equipment has made this possible. Unfortunately the work of some typesetters is no longer needed.

As computers get more and more "intelligent" their applications will alter employment in many areas. If computerization doesn't eliminate a job, it is likely to change it in some way. Even in the professions of law and medicine, computer skills will be needed to access a data base or use diagnostic equipment. Teachers will routinely use computers and educational software to teach and reinforce skills. Within the next ten years computer will be involved in 80 per cent of the jobs in our society.

5. What can be done to prevent unemployment caused by computer technology?

The simple answer to unemployment caused by computerization is training and re-training. Workers must be willing to learn about new and different technologies; the problem will not go away by ignoring it. Students preparing to enter the workforce must try to acquire computer skills as well as the skills of the particular field they are training for. For example, anyone now training to become an accountant should be sure to acquire some knowledge of computers to enable him to deal with the computerized accounting systems being used.

Activities:

1. Parents As A Resource - ask children to go home and interview parents and other family members to discover how computers have eliminated, changed or had no effect on their jobs. Students could report back to class or make charts showing their findings.
2. Future Want Ads- as a creative writing exercise have students write future want ads for traditional jobs and speculate on how the job may be changed by computerization.
3. Organize a "Computer Career Day". Invite parents to come in to discuss their job and how computers affect it.

TOPIC 34

Disadvantages of Computers - Depersonalization and Dependency

Aim: How do we depend on computers?

Performance Objectives: Students should be able to:

- define the terms depersonalization and dependency
- describe the way people become computer dependent
- describe the depersonalization that sometimes occurs when computerization takes place

Vocabulary: depersonalization, dependency, computerization, technological

Motivation:

Dependent vs. Independent

What does each of these words mean? Are you dependent or independent? In what ways are we a little of each?

Development:

1. In what ways is our society becoming "computer dependent"?

It seems that with all new things man at first resists trying it, but once the usefulness is seen man comes to depend upon these tools or techniques almost to the point of not being able to live without them. For example, think of the problems that are created when your family's car breaks down or the refrigerator stops working or the telephone goes out of service. These technological advances have become such an important part of our life style that we depend -count- on them to make our lives run smoothly. Although we may not realize it, to a large degree we have come to depend upon computer technology as well.

Our computer dependency can be observed in many areas of our lives. Aside from the large number of appliances, calculators and other devices that are powered by microchips, computers are helping to produce, regulate and control many areas of our lives. Computers are involved in the production of our automobiles, as well as the printing of our daily newspaper. Our stores, banks, hospitals and various levels of government would be hardpressed to keep records without this technology. Traffic lights, telephone systems, weather satellites and even our national defense systems are monitored and regulated by computers.

Although we personally may say, "I don't depend upon a computer", a quick inventory of the things, people and organizations that we depend upon will show that they depend upon computers. So in a very real sense we are computer dependent as well.

2. Is there anything wrong in being a "computer-dependent " society?

One problem inherent with depending upon anyone or anything is that from time to time you may be disappointed with the person or device because the expected service was unfulfilled. When this occurs you are usually inconvenienced and disappointed as well. For example, if you depend upon a bus to go to school and the bus breaks down, the result is you'll probably be late.

Unfortunately computers can also fail and leave the people depending upon them disappointed. Computer technology is powerful and sophisticated and our society has asked computers to provide vast numbers of people with some extremely vital services. The result is that if a computer system fails to perform as it should the magnitude of inconvenience could be very large. To be prepared for this is probably the best defense against computer failure. People, banks, stores, schools or other institutions should depend upon computer technology but they must have alternate provisions if the technology fails. We should depend upon computers but we should not forget how to be independent.

3. In what ways has increased computer use added a depersonalization to our society?

Depersonalization refers to the process in which a person is treated less as a person and more like a thing. This process began in our society during the Industrial Revolution when workers were treated solely as a means to producing a product and a profit and there was little concern for humanity. The rise of unionism and reform in America went a long way to stopping some of the harsher sides of this process.

With the advent of computerization of large parts of our society, some have said that a new wave of depersonalization has set in. There is now the feeling that companies, schools, hospitals, doctors or any kind of organizations that have computerized their record keeping and administration are relating to people less as people and more as data items in a computerized file. Prior to computerization, records and the relationships that they dealt with were much more people oriented. Organizations kept files and dealt with people on a one-to-one basis - a personal basis. With computerization much of this has changed. Your local druggist, for example, doesn't need to remember you and your allergy to certain medications because your record is easily accessible through the computer. The net effect of this kind of attitude exhibited by many of the people you come into contact with is that you may begin to feel that they know about you but they don't know you. You are not thought of as a person - only as an element in a data file - depersonalization.

Activities:

1. Ask students to make lists of businesses and organizations in their community that have become too computer dependent, i.e., couldn't operate without them.

2. Language Arts Related Activity - After discussion of the concepts in this lesson, have the students write a short story entitled, "The Day All the Computers Quit". Students should imagine what would occur in a computer free world. Would it be better or worse?

3. Have students create a chart with three columns as follows:

    NO LOSS
    SOME LOSS
    GREAT LOSS

Have students research and list under each column businesses they feel have had some loss, no loss or a great loss in personal service as a result of computerization.

4. Math Related Activity - Engage students in conducting a poll. Work with students to develop a questionnaire aimed at getting opinions concerning computer dependency and the impact of computers on the personal touch in various fields. Rexograph questionnaire and have students distribute to neighbors and parents. Tabulate and analyze results.

TOPIC 35
Computers in the News

Aim: Where Can We Find Computers In The News?

Performance Objectives: Students should be able to:

- identify current developments in the computer field
- describe the impact of computers on different fields

Vocabulary: telecommunications, electronic mail, pacemaker

Motivation:

Show the class a copy of a daily newspaper. Show students that newspapers are generally divided into sections. Elicit from class the names of some of these section and record them on the chalkboard. As the lesson develops note how computers are having an impact on a particular field.

Development:

Teachers should present the following news items to the students via rexo sheets and then discuss the "Think It Through" questions at the end of the section.

1. Business News

Telecommunications - the ability of computers to transmit and receive data of all kinds is changing the way business is conducted in many offices. What is needed to communicate is a personal computer, a modem, communications software and a telephone. Equipped with these a business can send and receive "electronic mail" of all kinds, e.g. sales reports, charts, graphs, memos or just about any kind of text. Because of this ability the significance of the "main office" is to some extent diminished. It may no longer be necessary to physically bring all personnel to the main office to review data; it could simply be transmitted to them for review and their responses can be transmitted back. Sales of telecommunication equipment amounted to about $150 million in 1984. Sales are expected to reach $2.2 billion by 1988.

THINK IT THROUGH

If transmitting and receiving data is possible using personal computers, what kind of impact will this have upon work as we know it? What groups of people will benefit the most from this technology?

2. Sports News

Possibly one additional gold medal should have been added to America's great collection from the 1984 Summer Olympics. This gold medal should be awarded for the winning job performed by computers at the games.

Computers contributed by IBM and AT&T added greatly to the smooth operation of this world event. Computers helped facilitate the rescheduling problems created when the Soviet Union announced its boycott of the games. The 10,000 athletes, 25,000 hotel rooms and $90 million in ticket sales were all kept track of by computers. Computers were even involved in the sporting events themselves as they were used to tally and display scores and do statistical analysis as well.

Athletes were even able to scout their competition by using the computer systems file on the athletes. In addition AT&T operated an Electronic Message System which answered an estimated 12,0000 questions, delivered 40,000 messages and transmitted 5,000 stories per day for each day of the Olympics. Do computers deserve a gold medal for the job they did?

THINK IT THROUGH:

Why were computers utilized more heavily in this Olympics than any other?

Why was it appropriate that an Olympics held in Southern California should make such great use of computer technology?

3. Crime News

The F.B.I. has begun to get involved in the abuse of computer networks by hackers (people who illegally enter computer systems). The F.B.I. held a series of coordinated raids in 13 cities in the U.S. seizing disks, hard copies and other evidence indicating unlawful entry into computer systems. Although many hackers try not to cause any damage when they enter a system, the potential for harm was illustrated when a group of hackers illegally entered the computer systems of the Defense Department and a system monitoring the medication given to cancer victims in New York. As a result of this and other such episodes, the U.S. Congress is currently holding committee hearings in an effort to enact legislation to stop these abuses.

THINK IT THROUGH:

Why should entering a computer system without permission be illegal? What kinds of damage could be done by these illegal entries? Why is it that young people are often involved in this kind of activity?

4. Education News

Tired of spending money on encyclopedias that are outdated by the time they are paid for? Now there is the "Academic American" by Grolier, an electronic encyclopedia. This reference work which is available through the Dow Jones News/Bibliographic Retrieval Service can be accessed through your personal computer with a telephone and modem.

The service costs about 60 cents a minute or $22 a month to use feature articles which are about 300 words in length and easy for children to read. To use the encyclopedia once it has been accessed by your computer, you simply provide the topic and you are given a choice of articles on the subject. Once you have made your selection it will be displayed on the screen and if you have a printer a copy can be printed as well. Research certainly has become much easier.

The Office of Technology plans to make this service available via its on-line telecommunication bulletin board service for all N.Y.C. Board of Education teachers/supervisors during the 1987-88 school year.

THINK IT THROUGH

How can this kind of computer application change the way we think of libraries? How will this affect certain groups of people who, because of handicapping conditions, cannot easily take advantage of our public libraries?

5. Computer News

Computer industry experts predicted that 1984 would be a banner year for computer sales. Predictions were that in this year sales would top seven million units. Unfortunately predictions were wrong with only five million units being sold. Analysts attribute this unsatisfactory sales record to consumer confusion as what to do with a machine once they bring it home. Consequently, the lower priced home computers were worst hit by this slackened demand. Evidence of this can be seen in the fact that two home computer manufacturers, Texas Instruments and Timex, simply stopped producing their lines, while Coleco and Atari experienced troubles as well.

THINK IT THROUGH:

As a future computer consumer, what warning is there in the fact that two manufacturers simply stopped producing their computer?

Medical News

Scientists have developed what they refer to as a "smart heart" - pacemakers that are operated by tiny microcomputers. These devices measure approximately 2 inches by 2 inches by 1/3 of an inch thick and cost between $2500 and $5000. They are powered by batteries that can last 7 to 15 years. These pacemakers are implanted about 1/4 of an inch under skin and can broadcast and be interrogated about the patient's heart's performance. They can even be re-programmed within the patient's body to meet current needs of the patient. Bert Braddock, president of Zymos Corp (the producer of the circuitry) states that it is like having an Apple computer in your body.

THINK IT THROUGH:

What are some other ways computers can be used to help doctors and other medical professionals?

Activities:

1. Have students produce a computer news program with anchorpersons and feature reporters. One group of students can be assigned to produce the news program every two weeks. Student should be guided toward using daily newspapers and weekly news magazines for information.

2. As a language arts related activity have students create a computer newspaper complete with different sections indicating the different applications of computer technology. Students may even wish to include classified ads in which computer hardware and software are sold and help wanted ads could also be written.

3. Create a computer news bulletin board in your classroom. Encourage students to keep their eyes open to find articles and stories about computers which could be displayed on the bulletin board.

4. If your school uses the public address system for morning announcements, your students might wish to produce a "Computer News Note", a brief story about computers and their application which would be presented each morning on the public address system.

History

Task Cards Used in This Unit

Topic 36	Historical 1-5
Topic 37	Historical 6-9
Topic 38	Historical 10-14
Topic 39	Historical 15-17
Topic 40	Historical 18-23

TOPIC 36
Computers of the Past

WHO DEVELOPED THE FIRST "COMPUTERS?"

Aim: Who Developed The First Computing Devices?

Performance Objectives: The students will be able to:

- explain reasons for needing better methods of calculating in the past
- identify, describe, and compare early devices used for calculating
- identify famous scientists who developed these devices
- recognize the relationships between these inventions and modern calculating machines

Vocabulary: abacus; mechanical; gears; loom; punch card; census; tabulating machine.

Motivation:

1. Ask one child to count the number of girls and boys in the class separately, and then to calculate the total number of children in the class as a whole.

"What might we use to help us count accurately and come up with the correct total?" Have them think of all possible answers: (our fingers, toes, paper and pencil, chalk and board, etc.)

2. "Suppose next we wanted to calculate the total number of boys and girls in the entire school, and after that, the number of boys and girls in all of New York City. Would we use the same methods as we named before, or would we use some different devices?" (Adding machines, calculators, computers) "Why would these be more appropriate in these cases?"

   The easier the calculation, the simpler the device. Complicated computing problems require more intricate computing machines.

Development:

1. Explain to the children that the very first computing device did not have to be created - it was the "fingers."

2. Explain that famous scientists in history realized that as mathematical problems became more complicated, there was more of a need for special machines to do calculations.

Because such machines did not yet exist, it took people a very long time to perform mathematical operations.

3. The following are "excerpts" from diaries written by 5 famous scientists who are important to the history of the computer.

Explain this to the children, and then have them read each one aloud and discuss. Questions for discussion can be found following the diary entries.

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Date: 1692
Dear Diary,

The Chinese were real clever when they invented the abacus, but that was thousands of years ago. Sliding beads on a wire has been a great idea, however, it does not help us to compute. I've been thinking of developing an arithmetic machine that would add and subtract numbers through the use of wheels and gears. I know I'm only 19 years old, but what do you think, Diary? Do you really think my idea will work?

Until tomorrow,
Blaise Pascal of France

Date: 1600's
Dear Diary,

If Pascal never invented the first mechanical calculating machine, I wonder if I ever would've created a similar machine that could multiply and divide, as well as add and subtract. Pascal's ideas sure helped me a lot with my own!

Until next time,
Gottfried Leibniz of Germany

Date: 1801
Dear Diary,

You must congratulate me! I've just invented a loom that weaves cloth using punch cards. I know, Diary, this is all new to you, so I'll explain. The punch cards have holes in them allowing threads to go through where they belong in a particular weaving pattern. Thus, I've improved on the loom and the entire weaving industry!

Until tomorrow,
Joseph-Marie Jacquard of France

Date: 1834
Dear Diary,

Have I got news for you! With my assistant, Miss Ada Byron, I have invented what I call a "Difference Engine." It accurately performs calculations of big numbers. Miss Byron helped me develop the special instruction cards that program the machine. My machine is the first to be able to process and store information!

Until next time,
Charles Babbage of England

Date: 1890

Dear Diary,

Well, it's 1890, and could you believe we just got back the results of the 1880 U.S. Census. That was 10 years ago. Why should we care about how many people were living in the United States then, when this is 1890? And who's going to care about the results of the 1890 U.S. Census 10 years from now, if it's going to take that long? There's got to be a better way to count up the figures, Diary, and I believe I've come up with it. Here's my idea:

It's a tabulating machine that would read information (data) recorded on a punch card. Each hole in the punch card would represent a piece of data about someone participating in the U.S. census.

Well, what do you think? *

Until tomorrow,
Dr. Herman Hollerith

*(The Diary apparently thought that it was a great idea, because with Dr. Hollerith's tabulating machine, the 1890 Census was calculated in just 3 years, instead of 10.)

Comprehension Questions:

1. What was Pascal referring to when he mentioned "beads on a wire?"
2. Did Pascal actually go ahead with his idea? How do you know?
3. In what ways do you think Jacquard's Loom changed the weaving industry?
4. Why do you suppose Babbage named his machine the "Difference Engine?"
5. What do you think of Dr. Hollerith's "better way?" What problems in our present society need to be solved in a better way?
6. How are these scientists' inventions related to each other? Perhaps they are not at all. What do you think?
7. List specific words to describe these men. Who do you admire most? Why?

Summary:

Throughout history, the need to develop quicker and more accurate methods of calculating was the basis of progress in the development of computers.

Follow-up Activites:

1. Activity card - Crossword Puzzle

2. Imagine that you are given the opportunity to interview the following people who made significant contributions to the development of the computer.

    1. Blaise Pascal
    2. Gottfried Leibnitz
    3. Joseph Jacquard
    4. Ada Byron
    5. Charles Babbage
    6. Dr. Herman Hollerith

    Prepare 2 questions to ask each person - You should focus on your curiosities concerning them and their ideas. What would you want to learn about? What do you want to know?

3. Write a short report on one of the people mentioned in #2.

TOPIC 37
What Were the First "Real" Computers Like?

Aim: What Were The First "Real" Computers Like?

Performance Objectives: The students will be able to:

- describe the present day computer as a descendant from a large family
- describe the direction taken in computer development
- recognize the progress shown throught the historical development of computers

Vocabulary: descendant; digital computer; electro-mechanical; electronic; vacuum tube; transistor; integrated circuit; integrated circuit chip.

Motivation:

Have children illustrate their family trees, including grandparents, parents, and siblings. Outline a family tree of this nature on the board for them to follow as a guide.

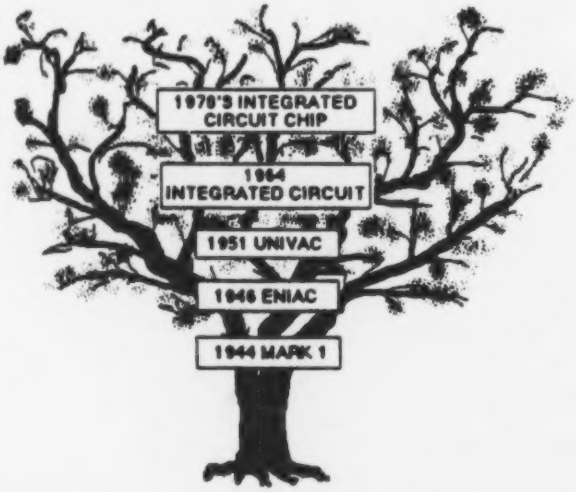
Explain to the children that they descended from their parents, who descended from their parents, and so on. This makes up their family. Allow them to talk about their families.

Computers also descended from "parent" computers.

Development:

1. Explain that as time went on, there was a greater need for machines that could do more than just calculate which was primarily what the other machines did. People needed a machine that was capable of performing conditional operations, programming, and would have long-term memory. What they needed was a COMPUTER.

2. Draw a Computer Family Tree on board like the one pictured below. Explanations for each member of the family found are below it.



1944 MARK I - First electro-mechanical computer (has electrical and mechanical parts). Huge machine, about the size of a gym.

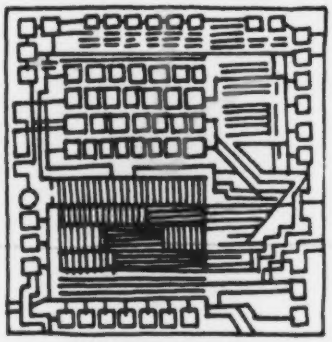
1946 ENIAC - First completely electronic computer. Was used in World War II.

1951 UNIVAC - First commercial computer. Conducted electricity though vacuum tubes. (Switches current on and off). Late 1950's transistors - replaced vacuum tubes; conducted electricity faster; rarely needed to be replaced.

1964 Integrated Circuit - took place of transistor; smaller - took up much less space.

1970's Integrated Circuit Chip - Thousands of circuits on one tiny chip - chip is so tiny the circuits are microscopic.
Capable of 10,000,000 calculations per second!

Actual-Size Chip



Enlarged Chip

(It would be fun to time the children in calculating one mathematical problem and see how many seconds it takes them - they can compare themselves to a computer, and get a better idea of the concept of what it really means to do something in a second - "What can you do in one second? Is there anything?")

3. After the tree of computers is done, it is important to explain that computers were getting much smaller as they were "being born."

4. Also explain that these computers were called digital computers, meaning they changed information into numbers to be stored and processed.

Summary:

Modern computers are the "children" of computers of the past.

Follow-up Activities:

1. Activity flash cards where children check themselves. If the puzzle pieces match up, then they are correct.

2. Man by nature is constantly trying to better himself. He has evidenced this from prehistoric to present times.

An example of this would be the caveman's discovery of fire, to the torch, to the oil lantern, to the electric light bulb, or lamp.

How is the COMPUTER an example of the PROGRESS man has made?

Do you think man can continue to advance himself where computers are concerned? Explain.

TOPIC 38
Modern Computers

Aim: How Have Computers Changed Since The First Computer Was Built In 1944?

Performance Objectives: Students will be able to:

- identify the important characteristics of each generation of computers
- understand how the computer has changed in size, cost and efficiency

Vocabulary: digital computer, generation, ENIAC, vacuum tube, transistor, UNIVAC, integrated circuits, chip, microchip

Motivation:

Write the title "Four Generations of Modern Computers" on the chalkboard. Tell students they will be reading an article with that title. Ask them to guess what the article will be about.

Distribute the article "Four Generations of Modern Computers." (This article appears in Board of Education publication Computer Literacy - Elementary Grades - Experimental, p.165-170 and in Computer Literacy - Intermediate and Secondary Grades - Experimental between pages 12 and 13. A print copy is attached.) Have the students skim the article to see which of their guesses were correct and which were not.

Pass around classroom actual computer parts of each generation and explain:

- First Generation - Vacuum tubes
- Second Generation - Transistors
- Third Generation - Integrated circuits
- Fourth Generation - Use of chips and microchips

Development:

1. Read the article.
2. How do today's computers differ from earlier computers?
3. What might future computers be like?
4. What advances might take place in computers for them to become as common in people's homes as television sets are today?
5. Why do you think the ability to store a program was a very important advance in computer technology?

Application:

1. The price of computers has fallen about 50 per cent every two years. A large business computer costs $40,000 today. If past trends continue, how much will a similar computer cost in two years? In four years?

2. Soon home computers will cost as little as television sets. Do you believe that everyone who can afford to buy a computer will do so? Explain your answer.

3. Develop a time line which illustrates the chronological development of the four generations of computers.

Summary:

1. How have computers changed since 1944?

2. Predict what new changes in computers we can expect to see in the near future.

Assignment:

1. Complete the activities listed below the article "Four Generations of Modern Computers.

2. Pretend you are a salesperson. Design an advertisement for a computer of each generation. Include a description of the computer and explain how it will help people. Include the advantages it offers over an earlier generation of computer, where applicable.

3. Research and report on fifth generation computers.

TOPIC 39
Future Computers

Aim: What Will Computers Be Like In The Future?

Performance Objectives: Students will be able to:

- identify the important characteristics of modern computers
- make predictions of future computers

Vocabulary: New: translator, electronic, bubble memory, artificial intelligence, videodisk, telecommunication, robot, speech synthesizer, fifth generation

Motivation:

Ask the students what they would like computers to do.

Discuss robots and what role they will play in the future.

Discuss video games and the sound effects they have.

Development:

1. Demonstrate various capabilities of present day computers:

   a. A program that has sound and graphics for the children to see and hear.
   b. A repetitive program like the ones used in digital clocks, to illustrate the ease with which a computer can perform loops.
   c. An arithmetic program showing its accuracy.
   d. A decision-making program using the IF/THEN statement based on data the computer has been given to illustrate its logic capability.
   e. A data base illustrating the large amount of information a computer can store.
   f. A program using a time delay to illustrate how fast a computer can count from 1 to 300 (one second).

2. Describe development of videodisks, each of which can store more information than five thousand floppy disks; new switches which are faster than transistor switches; bubble memory storage which doesn't depend on electricity.

3. Introduce the concept of artificial intelligence in computer programs.
   a. Computers that play chess.
   b. Computers that ask patients questions and diagnose their illnesses.
   c. Computers that find error patterns in students' answers to math problems.
   d. Computers that recognize shapes in television pictures.
   e. Computerized appliances that make housework easier.
   f. Robots to perform boring, repetitious jobs.
   g. Computers that can translate from one language to another.

4. Introduce the concept of a cashless, paperless society brought about by:
    a. Telecommunication from a home terminal connected to terminals in businesses.
    b. Electronic mail which will not need paper or postage.
    c. Electronic bank tellers to take deposits, cash checks, pay bills and make loans.
    d. Information networks which will serve as paperless encyclopedias.

Application:

1. List some of the things in your home which could be done by computerized appliances or robots. Explain why by referring to the built-in capabilities of the computer.

2. Discuss with your parents and then list all the ways in which paper could be saved if correspondence was done electronically instead of by mail.

3. In the future how might household furnishings differ from what you have in your home today? Based on new computer technology, what new things would you buy? What things might you discard? Give reasons.

Summary:

1. How will future computers be different from present computers?

2. How will advances in computers affect our society?

Follow-up Activity:

Have a class visit A.T.&T.'s Infocom, and then discuss fifth generation computers.

Assignments:

1. Write a play, dialogue or composition describing an encounter with a fifth generation computer.

2. Draw pictures or construct models to illustrate their ideas of what future computers will look like.

3. Write a description of a family which can work, shop and play without ever leaving the house because of their computer terminal.

4. Plan to debate the question "Computers will make life more interesting in the future."

TOPIC 40
Computer Futures

Aim: What Will Computers Be Like In The Future?

Performance Objectives: Students should be able to:

- identify future advances in hardware
- identify projected developments in artificial intelligence
- identify advances in the input process
- explain what impact computers may have upon work as we know it

Vocabulary: LSI, VLSI, ENIAC, input, output, process, scanner, OCR, artificial intelligence, telecommunicate,

Motivation:

Most students are probably aware of the famous Star Wars robots R2D2 and 3CPO. If possible, secure a picture of these and ask students to identify. Initiate a discussion as to what made these robots exceptional. Discuss the possibility of actually producing robots with these features.

Development:

1. How are computers changing today?

   Since the first computers were introduced in the late 1940's, their history has been one in which computers have gotten smaller, quicker and cheaper. The first generation computers used vacuum tubes to conduct the flow of electricity and were consequently quite large. In fact, ENIAC, the first digital computer, had 18,000 vacuum tubes and weighed 30 tons. Fortunately, subsequent developments of transistors, integrated circuits and integrated circuit chips enabled calculations - the heart of computing - to be accomplished much more quickly and computers became smaller as well.

   Currently, we are in the fourth computer generation which is characterized by microchips that exhibit large scale integration (LSI), in other words an incredible number of electrical circuits etched on a tiny silicon chip. Fifth generation computers which are currently in development will be known for Very Large Scale Integration (VLSI). In other words more circuits in a smaller area resulting in smaller and speedier computers. First generation machines did 39,000 calculations per second whereas fourth generation machines do 200,000,000 calculations per second. The difference for the user is most obviously speed and size.

2. Why does the increase in processing present input challenges for users?

   The computing process has three distinct parts. They are:

   input - the entering of data to the computer
   process - the computer's manipulation of the data
   output - the displaying of the results

Most advances in computers have concentrated on the process portion of this sequence. Computers have become more and more capable of processing the data input at amazingly higher speeds. Unfortunately, the input process has not improved as much.

In fact, the primary input devices - disk, tape and keyboard - have not really kept pace with the increased processing speeds. The net result is that the input phase in a real sense presents a roadblock to realizing the full potential of better processors.

As a result of this, computer scientists are now beginning to give increased attention to the field of data entry. One possible means of improvement in this area would be the increasing use of scanners, optical character readers (OCR)-devices that when passed over a printed page can recognize characters (letters) and input them to the computer. Currently the most common application of scanners is in supermarkets and department stores where product codes and prices are read by scanners.

Possibly the most ambitious efforts in the data input field are the attempts being made to enable the computer to understand human voice. A great deal of progress has already been made in this area but a great deal more must still be done. Much of the difficulty lies in the fact that hearing is not just an auditory function. In fact speech recognition systems have to enable computers with recognition of homonyms and to discern meaning from the context of a sentence.

3. If future computers can understand human voice, will they in some senses think?

As the computer revolution advances, the concept of artificial intelligence comes closer to reality. For many years the computer has had the ability to parallel and surpass the abilities of the human brain in remembering data, performing mathematical operations and making logical decisions. However computers have always lacked in certain kinds of abilities. For example, computers have lacked the ability to draw inferences - taking educated guesses, or to apply past knowledge to a present situation and provide a prediction or to distinguish between literal and figurative language. However, computer scientists have, with some degree of success, been able to program computers to overcome some of these shortcomings. For example, the following software packages are in some senses "intelligent".

PROSPECTOR - this computer software will make predictions about ore deposits in certain areas based upon data presented to it.
INTERNIST - this computer software will make a medical diagnosis based upon data presented by the doctor concerning patient's symptoms and tests. As the data begins to point in one direction the software will begin to probe deeper in this area and finally make a diagnosis.
FRUMP - this software will "read" a news story and write a one-sentence summary of the article. Even more amazing this sentence can be written in Chinese and Spanish, as well as in English.

Computers are being developed to parallel human thought more and more. Thus in a true sense computers are becoming more and more intelligent.

4. How will future computer applications change our society?

As the software and the hardware get more and more affordable, the greatest future development possibly lies in the application of the technology. The home of the future will be one in which the microcomputer will be used as routinely as the family telephone. In fact, through the use of a modem the home computer will enable each household to connect to any one of a number of data bases (a systematic electronic collection of information). Through these data bases it will be possible to do the family's banking, get the mail, learn a new skill, research a topic, check a stock or do some shopping. Large companies called information utilities have and will continue to develop which offer subscribers the possibility to connect to a variety of data bases.

Possibly most revolutionary of all will be the impact on the world of work. The author Alvin Toffler suggests that since many of today's jobs are centered on dealing with data-analyzing, changing etc. - it is possible for people to simply work at home via their home computer and communicate with their firm's mainframe using a modem and the telephone lines. Toffler predicts this potential for "telecommuting", i.e. working by transmitting data over the telephone lines, may eventually place a significant percentage of the work force in the home and impact family life, traffic patterns, energy usage and rents in office buildings.

Activities:

1. Engage students in a discussion of where computers are being used in their community. Develop a list of banks, supermarkets, schools, hospitals, etc. Have students visit some of these places to observe how input is accomplished, i.e. scanners, keyboards etc.

2. Artificial intelligence has largely been a product of science fiction. Have students write a short story entitled "The Smart Computer". Students may assign the computer as much intelligence as they like. Afterwards ask student volunteers to read stories to the class and discuss the probability of certain abilities.

3. Students may wish to practice their business writing skills by writing to an information utility to secure information about their services. They may write to: The Source, Source Telecomputing Corp., 1616 Anderson Road, McLean Virginia, 22102 or Compuserve, Personal Computing Division, 5000 Arlington Centre Blvd, Columbus, Ohio, 43220.

4. Discuss the possibility of people "telecommuting". How would this change many aspects of life. Make a list of jobs and rate the jobs chances as a candidate for telecommuting. Jobs could be rated as possible, impossible or somewhat possible.

5. Have student construct a diorama illustrating the ways computers will be employed in homes of the future.

Programming

Task Cards Used in This Unit

Topic 41	Programming 1-5
Topic 42	Programming 6-8
Topic 44	Programming 9-13
Topic 45	Programming 14-17
Topic 46	Programming 18-19
Topic 47	Programming 20-22
Topic 48	Programming 23-26
Topic 49	Programming 27
Topic 50	Programming 28-32
Topic 51	Programming 33-36
Topic 52	Programming 37-44
Topic 56	Programming 45
Topic 57	Programming 16, 37, 46, 47
Topic 58	Programming 48-57
Topic 59	Programming 24
Topic 61	Programming 20
Topic 62	Programming 58-61
Topic 63	Programming 9, 19, 62-64
Topic 66	Programming 65-66
Topic 67	Programming 67-72
Topic 69	Programming 28
Topic 70	Programming 31, 73-77
Topic 72	Programming 78
Topic 77	Programming 79
Topic 78	Programming 53

Note: Some task cards in this unit
may be used with more than one topic.

TOPIC 41
What Languages Can a Computer Speak?

Aim: What Languages Can Be Used To Communicate With Computers?

Performance Objectives: Students should be able to:

- define the role of a programming language
- name the major programming languages
- describe how programming languages have parallels with other languages

Vocabulary: programming language, compiler, COBOL, PL/1, BASIC, ASSEMBLER, FORTRAN, LOGO, binary, syntax

Motivation:

Children are often fascinated by foreign languages. Perhaps some children are bilingual and they can be called on to provide the class with the different words for "HELLO", e.g., Buenos dias, Bonjour. Use this as a starting point for a discussion of the purpose of languages in general.

Development:

1. What is the purpose of a programming language?

   The purpose of a programming language, as is the purpose of any language, is to communicate. Unlike English, Spanish or French which are used to communicate with people, a programming language is used to communicate with a computer.

   Computers store and process all data and information in binary digits (0's and 1's). This internal machine language is much too difficult for most people to master. In order to enable more people to use computers, computer scientists developed programming languages which most people can master.

   The sequence works more or less like this: A programmer writes a program in a programming language. Once this program is inputted it is translated by the compiler - an internal program that converts the programming language into machine level language. Once this translation occurs the computer can carry out the task and output the results.

2. What is a programming language like?

   In some ways programming languages are similar to any other language. Just as English has a definite vocabulary and set of grammatical rules, a programming language has its own vocabulary of key words and syntax of its own. Unlike English which allows for a variety of ways to express an idea, programming languages are much more inflexible.

   If a programmer varies from the prescribed syntax of a particular statement the computer will reject the statement and issue the error message "SYNTAX ERROR".

3. What are the names of some of the most common programming languages?

NAME	DATE	USE
ALGOL "ALGORITHMIC LANGUAGE"	1958	Good for scientific work
APL "A PROGRAMMING LANGUAGE"	1962	Used for scientific models.
BASIC "Beginners All-Purpose Symbolic Instructional Code"	1965	Easy to use; used primarily with microcomputers.
COBOL "Commercial & Business Oriented Language"	1959	Business applications
FORTRAN "Formula Translation"	1954	Scientific uses
PASCAL (named after Blaise Pascal)	1971	All purpose
PL/1 "PROGRAMMING LANGUAGE ONE"	1964	Utilizes the best aspects of COBOL and FORTRAN; all purpose language.
LOGO for "word"	1967	Easy to use language; uses the Greek words; used very often with children

4. What programming languages are most often used with microcomputers?

   The programming languages most commonly used on microcomputers are BASIC, PASCAL and LOGO. The most widely used is BASIC which was developed by John Kemeny and Tom Kurtz at Darmouth University in 1965. It is important to note however that there are many different versions of BASIC and each version will have it own distinctive features.

Activities:

1. Programming Language Collage: Ask students to use the want ads from the Sunday TIMES or NEWS and cut out ads for programmers with expertise in different programming language. Use these ads to create a display showing the many different languages that have been developed.

2. Have students develop an annotated dictionary of computer languages. The dictionary should provide background and description of the languages' strengths. Student may cut out or draw pictures to demonstrate these strengths.

3. Ask students to create a time line showing the progress in developing programming languages.

4. Parents As A Resource - ask students to interview family members who use computers and find out what languages they "speak". Report back to class.

5. Programming Language Scrapbook - each page in the scrapbook should be devoted to a particular programming language. On each page students might incorporate background on the language as well as ads for programmers in that particular language.

TOPIC 42
What is BASIC?

Aim: What Is BASIC Used For?

Performance Objectives: Students should be able to:

- define BASIC
- distinguish between BASIC commands and statements
- define the similarities between English and BASIC

Vocabulary: BASIC, programming language, statements, commands, execute

Motivation:

Can you guess what each letter in BASIC stands for

B--------
A-- -------
S-------
I------------
C---

(Teachers may conduct this like a "hangman" game - having the students guess at letters until the puzzle is solved (Beginners All Purpose Symbolic Instructional Code)

Development:

1. What is BASIC?

   BASIC is a programming language. Like other programming languages, it is used to instruct a computer to complete a task. Unlike many other programming languages it is rather easy to learn. In fact, BASIC was developed by Professors John G. Kemeny and Thomas E. Kurtz in 1965 to be user oriented and easy to learn by people with little or no programming experience.

2. What is BASIC like?

   To begin to understand BASIC it must be understood that BASIC is a language. As such it has its own vocabulary which can be used in its own set of language patterns (syntax) to create BASIC instructions -either statements within a program or a command. If an instruction is expressed as a command, the computer will carry out the command immediately after ENTER/RETURN is pressed. The command will appear on the screen and the output will appear directly below the command. For example:

```
PRINT 9 + 3
12
```

   When using BASIC commands we are using the computer in the "immediate mode."

If a BASIC instruction is expressed as a statement - the statement is part of a program. A program is a set of specific instructions that direct the computer's operations. Each statement within the program is numbered.

Once the statement is typed it is recorded in the computer's memory by pressing the ENTER/RETURN key. It is important to note that unlike a command, a statement will not be immediately carried out. Rather once the entire program is typed in and the user types the command "RUN" and presses ENTER/RETURN, the computer will execute each statement sequentially, proceeding from the first statement to the last statement. The net effect of executing each statement is to complete the task at hand.

3. In what ways is BASIC like English ?

BASIC and English are both languages. English is used to communicate with people while BASIC is used to commuicate with computers - microcomputers in particular. English has a predefined vocabulary which when used according to the rules of its grammar creates meaningful sentences which can be put together to create paragraphs. In a similar manner BASIC has a predefined vocabulary which when used according to the language's syntax (rules) can create commands and statements. These statements can be put together to create a program.

BASIC and English are both languages and as such there are parallels which help us to understand.

Activities:

1. Ask students to make comparison charts showing the similarities and differences between English and BASIC.

2. Prepare student for later instruction in BASIC by providing a list of BASIC key words e.g., PRINT, GOTO, LET, FOR/NEXT.

   Have students copy a list into their notebooks for later use. At this point understanding of each term isn't as important as simply recognizing the terms when they are encountered. Reinforcement can be accomplished by having students make posters, collages and mobiles using these words.

3. COMPUTER WORD SCRAMBLE- Ask students to unscramble each term and then match with it with the correct definition:

(ENTER) NTERE
(MICROCOMPUTER) TERPMUOCORCIM
(STATEMENT) NTEMTTEAS
(BASIC) SICBA
(EXECUTE) UCETXEE
(COMMAND)MMNADOC
(RUN) NRU
(PRINT) RPINT
(SYNTAX) ASNYTX
(ENGLISH) SHNELGI

---the language we speak
---computers understand
---press this to access the memory.
---to carry out instructions
---carried out when RUN is entered
---causes the computer to print
---carried out immediately
---language rules
---small computer
---command that carries out the program

TOPIC 43
Getting Ready For a Task

Aim: How Do You Prepare Your Computer To Perform A Task?

Performance Objectives: Students should be able to:

- list the steps necessary to ready a computer for a task
- explain the purpose of an operating system
- explain how a computer "knows" BASIC
- explain what is meant by the "dialects" of BASIC

Vocabulary: operating system, ROM, programming languages, dialects

Motivation:

Ask each student to make a list of five ways a personal computer could be used by someone their age.

Development:

1. What things have to be done before a computer is ready to do a task?

A) CHECK CONNECTIONS - Before a computer can be used to do any kind of job whatsoever the user must first be certain that all the connections are properly made. The computer should be connected to the CRT and if available to the printer. The computer, CRT and printer should then be plugged into the electrical outlet.

Once all the connections are secured, the user should refer to the user's manual for his specific system. For non-disk systems the user may simply turn on the computer and follow what is known as a start-up dialog with the computer.

With some disk systems (IBM, APPLE), it is necessary to insert the disk with the operating system into the drive and then turn on the computer. On other systems (Radio Shack), the disk is placed in the drive after the system is turned on. A user must consult his manual for specific system instructions.

B) ACCESSING THE OPERATING SYSTEM - An operating system is the software program that directs all of the computer's operations. The operating system acts as a manager of sorts; it tells the computer how to use both the hardware and the software.

Depending on what kind of computer system you are using, the operating system may either be "built in" or it may be necessary for it to be loaded from an external memory device. If the operating system is "built in", it is in the ROM, the Read Only Memory, and all that would be necessary to utilize it would be to turn on the system and respond to a start-up dialog. If the operating system is not built in, it must be loaded from diskette.

Since different computers have different operating systems, a user must make sure that whatever software is going to be used is compatible with the computer's operating system.

C) USING BASIC - Once the operating system is loaded, the computer is able to manage a programming language. The language most often used with microcomputers is BASIC. Again depending on the computer you are using, BASIC will either be built in, i.e., in the computer's Read Only Memory (ROM), or must be loaded into the computer's RAM, Random Access Memory. With built-in BASIC, the user must go through a start-up dialog in order to access it.

If the system doesn't have BASIC built in, then it must be loaded into the RAM from an outside memory source, disk or tape. The computer is ready to take on a task once BASIC is accessed. Of course the user will have to tell the computer how to perform this task by writing detailed instructions, a program, in BASIC. This program is then inputted to the computer's RAM through the keyboard and if the instructions were correct the task will be completed.

2. Do all microcomputers understand the same BASIC ?

The BASIC programming language used on most microcomputers is by and large the same language. However small language differences do exist in the different versions of BASIC, e.g., Microsoft BASIC, Applesoft BASIC, Integer BASIC, GWBASIC, True BASIC, etc. Because these BASICs are very similar and the differences so small, it would be inappropriate to refer to them as separate languages. Instead they are referred to as the different "dialects" of BASIC. These differences, however small, must be taken into account by the programmer and allowances made.

Activities:

1. Have a poster contest. Ask students to make posters outlining the steps necessary to make your classroom's computer ready for a task. Prizes amounting to extra computer time might be presented to the most imaginative or the easiest to follow.

2. Ask students to create "keyboard helpers" - index-sized cards that can be secured near the computer's keyboard. On the card the student should outline the steps to take to get the computer ready for a task. Students should be encouraged to be imaginative with the shape, color and design of the card as long as the procedures are outlined accurately.

3. Engage students in a computer system profile. Have students discover the following information about the classroom computer:

NAME-----
MEMORY SIZE ---
COST-----
OPERATING SYSTEM----
PROGRAMMING LANGUAGE----
PERIPHERAL EQUIPMENT----

4. Find out which students have microcomputers at home. There may be a number of different systems represented in the class. Ask the students who have computers to bring in the manual. Engage students in creating a conversion chart for the different BASIC languages. For example:

	RADIO SHACK	APPLE	TEXAS INSTRUMENTS
Clear the SCREEN	CLS	HOME	CALL CLEAR

This chart can be displayed prominently in the classroom and be added to throughout the year as students learn new programming statements.

TOPIC 44
Direct Mode and PRINT

Aim: How Can We Instruct the Computer to Print our Message on the Screen?

Performance Objectives: Students will be able to:

- understand the purpose of the direct mode
- use the direct mode to instruct the computer to use the command PRINT
- use quotation marks to enclose the message to be printed on the display
- use the space-bar to separate characters (letters, numbers, symbols)
- use the shift key to get quotation marks
- instruct the computer to perform the task by pressing the carriage return

Vocabulary: NEW: direct mode, quotation marks, PRINT, error message,
Review: cursor, carriage return

Motivation:

Create analogy for the class:

You are in kindergarten or first grade. The teacher has taught you how to print with your pencil. What is printing?
Why is it an important skill?

Discussion: It allows a person to get a thought onto paper and it allows someone to read it later. Computer analogy: Computers can also make a message known to others but only when they are given proper instructions.

We will learn to give the computer instructions to print our message.

Development:

1. What do we use to communicate with the computer? (the keyboard)

2. Methods of giving instruction to the computer: direct mode or immediate mode.

   What is the direct mode? (It lets us give the computer a direct command so that we can see the results right away.)

3. Typing messages: How will you tell the computer your name? (type your name) Where does your name appear on the screen? (Wherever the cursor is flashing)

   What key must we press to make the computer understand us and do what we tell it to do? (carriage return)

   After you pressed the carriage return what did the computer do? (an error message) What does an error message mean? (The computer doesn't understand what we typed in)

4. Give commands that the computer will understand: If your mother gave you $10.00 and didn't tell you what to do with it, and then she asked you if you had returned from your errand what would you think? (confusion; need instructions)

   What did the computer think when you typed your name but didn't give it any instructions? (confusion; need instructions)

   What do you want the computer to do with your name? (PRINT it)

   What instruction do you think would make the computer understand that we want it to PRINT our message? (Type PRINT and your name, press the carriage return)

   What happened when we tried it? (A zero appeared. The computer tried to give your name a number (numerical) value.

5. Solving the problem:

   How can we get the computer to print your name exactly as you type it? (Type PRINT. Put your name in quotation marks, and press the carriage return.)

   How do we get quotation marks? (Press SHIFT and quotation marks.)

   What happened this time? (The computer printed your name but it left out the word PRINT and the quotation marks.)

   Why do we need quotation marks? (They tell the computer where the message begins and ends.)

   What must we use if we want to type a sentence? (a space-bar to separate the words)

<u>Applications</u>:

For each of the following examples, decide what the computer will do. If the computer will not PRINT the message as it is written, then correct the command. Check your answers by keyboarding each example into the computer. Keyboard the correct example to see if you were right.

```
 .PRINT Hi. "Will you be my friend?"
 .PRINT "Billy is silly."
 .PRINT "I like ice cream.
 .PRIMT "What's up, Doc?"
."PRINT "What is two plus two?"
 .PRINT"****HELLO****"
 .PRINT "GOODBYE".
```

Summary:

What steps must be followed to put a message on the video display?

1. Type the command PRINT, spelled correctly, to tell the computer to put the message on the video display.
2. Type quotation marks at the beginning and end of the message so the computer knows what the message is.
3. Press the carriage return to tell the computer to perform the task.

Projects:

1. Using the space-bar and/or the arrow (direction) keys, move the cursor around the screen to different positions and type your name.
2. Children should be able to make up messages to be printed on the display.
3. They should keyboard in the instructions which will direct the computer to print the messages on the screen.
4. Children can work in pairs to have a "computer conversation" with each other. One prints a question and the other prints the answer.

TOPIC 45
The PRINT Statement and Strings

Aim: How Can We Tell the Computer to Print our Message by Using a Code?

Performance Objectives: Students will be able to:

- . define strings
- . write string variables
- . use string variables to print a message

Vocabulary: New: data, memory location, string, string variable, alphanumeric characters
Review: Print, carriage return, cursor

Materials: envelopes, pencils or crayons

Motivation: Code games:

A=LOVE B=I C=CREAM D=ICE

Using the above code rewrite this message.
What do the letters represent? (The letters stand for words.)
Computer analogy: We can make the computer use code letters which will stand for words or groups of words.

Development:

1. How did we print our names? (PRINT "Name")

2. What do we call anything inside the quotation marks? (a string)

3. What is the definition of a string? (A string is a group of alphanumeric characters.)

4. What is alphanumeric? (letters and numbers or symbols)

5. Besides our names, what are some examples of strings? (****HELLO****, GOODBYE, 891-7142*)

   * Note: The hyphen makes the telephone number alphanumeric.

6. How do we tell the computer to remember a string? (We use an assignment statement.)

7. What is an assignment statement? (An assignment statement places or assigns a value to a variable.)

8. What is a string variable? (A string variable is a symbol like a code letter or sign which represents an expression.)

9. What does a string variable look like? (A letter with a $ sign.)

10. How many letters can we use in front of the dollar sign? (Usually, we use one letter. Most computers will accept two characters before the $.)

11. What are some examples of string variables? (A$,M$,AM$,BL$)

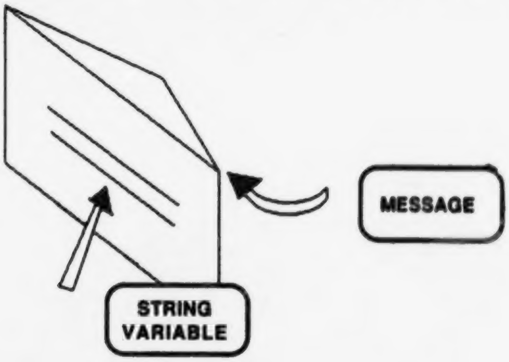
12. How do we store information in a string variable? (We write the data and enclose it in quotation marks.)

13. What is data? (information)

14. What are some examples? (A$= "Hello") (B$= "GOODBYE") (C$=" Do you love ice cream?") (D$=" I am ten years old.)

Applications:

1. Here is an envelope. On the front write a string variable.
   Use the letter A followed by a dollar sign.
   Turn the envelope over and write a short message on the inside flap of the envelope.



   Put quotation marks in front of and at the end of your message.
   Close the flap and write PRINT A$ on the bottom of the envelope.
   Turn the envelope over.

   It tells you that A$= "HELLO" and HELLO is printed on the inside flap.
   If you press the carriage return the computer will print HELLO.
   The quotation marks will not appear on the screen.

2. One of these examples is correct. Can you find it?

```
A$ = "HELLO"
PRINT A$

B$="MY NAME IS JOHN
PRINT B$

"C$= GOODBYE COMPUTER"
 PRINT C$

D$="MY BROTHER IS A PAIN"
PRINT "D$"
```

Summary:

1. How does the computer store data? (in memory locations in the computer)

2. What are alphanumeric data? (information made up of symbols such as letters, numbers, or signs)

3. What are the characteristics of string variables? (a letter followed by a dollar sign.)

4. How can we use string variables? (We can store words, groups of words, or groups of words and numbers in the computer. We can recall them by asking for the string variable.)

<u>Activities</u>:

1. Which of the following is not a string variable name?

   a. AB$
   b. DR$
   c. B$
   d. 31$ (3L$ is not a string variable)

2. Assign string variable names to make a code game. Each string variable should represent a different word to make up a sentence.

3. Whole class activity -

```
A$= "      " (a person's name)
B$= "      " (a verb)
C$= "      " (an adverb)
```

4. Rewrite the code in the motivation exercise as assignment statement.

TOPIC 46
Introduction to Programming - Using Line Numbers With the PRINT Statement

Aim: How Can We Write a Program for a Computer?

Performance Objectives: Students will be able to:

- use the PRINT commmand to display output
- explain what a program is
- explain how to put instructions into the computer's memory bank
- write a simple program using PRINT statements
- state the difference between the direct mode and the programming mode

Vocabulary: New: program, programming mode, line numbers
Review: Print, immediate/direct mode

Motivation:

I have just bought a new record and I want to play it on my turntable. Tell me exactly what I must do to solve this problem. How can I play the record on the turntable?

Answer:
1. Remove the record from the album jacket.
2. Place the record on the turntable.
3. Turn on the power.
4. Place the stylus on the record.
5. Adjust the volume.

(Accept all logical sequences of steps.)
Computer analogy: A computer program is like this list. It is a list of instructions. The list is carried out by the computer. The computer carries out the instructions in the order of the numbers given at the beginning of the list.

Development:

1. What is a program? (It is an ordered list of instructions)

2. What occurs in the programming mode?

   - The computer stores instructions in its memory bank until it is told to put them in operation.
   - Instructions are given line numbers to keep them in order while they are being stored in the computer's memory.
   - The computer follows each set of instructions in the order assigned by the line numbers.
   - The last program line should be called END. END tells the computer that the program is finished.

3. Let's write a program for the computer. Let's list the days of the week:

```
1 PRINT "SUNDAY"
2 PRINT "MONDAY"
3 PRINT "TUESDAY"
4 PRINT "WEDNESDAY"
5 PRINT "THURSDAY"
6 PRINT "FRIDAY"
7 PRINT "SATURDAY"
8 END
```

4. Remember to press the carriage return after each line.

Applications:

1. Write a program that will list the names of five friends.

2. Write a program that will list the months of the year.

Summary:

1. How is the programming mode different from the immediate or direct mode? (The programming mode has line numbers.)

2. How do the line numbers affect the program? (The computer follows the numbers as it performs each task.)

3. What is the purpose of the word END? (It tells the computer that the program is finished.)

Projects:

Write a program for each of the following lists:

1. Your birthday and the birthdays of the members of your family.

2. Put the list of birthdays in order of the youngest to the oldest member of your family.

3. Your five favorite records.

TOPIC 47
Programming Line Numbers and System Commands

Aim: How Do We Use Line Numbers?

Performance Objectives: Students will be able to:

- understand the purpose of listing line numbers in increments of 10
- analyze and execute LIST commands to discover the results
- keyboard a program on the computer and execute it

Vocabulary: New: AUTO, LIST, Input, BREAK, RESTORE, STOP, RUN
Review: PRINT, line numbers

Motivation:

What do you like the least about writing compositions?
(Proofreading, rewriting)

How might a computer make the job more enjoyable?

We are going to see how programming allows us to change the order of words. It also lets us add words that we might have left out.

Development:

1. What does a program look like?

```
10 PRINT "WHAT"
20 PRINT "IS"
30 PRINT "YOUR"
40 PRINT "FAVORITE"
50 PRINT "COLOR?"
60 END
```

2. How are these line numbers different from the other programs we have done? (These line numbers are going up in groups of 10.)

3. Why should we keyboard our line numbers in steps of 10? (If we leave out information we can add a line to the program)

4. Why must we press the carriage return after each line? (We press the carriage return to put the information into the computer. This is called Input.)

5. When we are finished how can we see the program we wrote? (Press LIST)

6. If we make a long list of instructions how can we see the beginning of the program? (To LIST only portions of the program we use the following command:
   LIST 10-30 which instructs the computer to LIST lines 10 though 30.)

Note: Press clear to get a clear screen. (or HOME or CLS or RESTORE or SHIFT and CLEAR

7. To execute the program type RUN and ENTER or Carriage Return.

APPLICATIONS:

1. For the following program, decide what the program will look like when you press LIST:

```
10 PRINT "WHAT"
20 PRINT "IS"
30 PRINT "YOUR"
40 PRINT "GAME?"
35 PRINT "FAVORITE"
50 END
```

2. Make a list of 15 children in this class. Instruct the computer to LIST the first four names.

3. Write a program of 5 words that will make a sentence. Leave out the verb. Add it at the end of the program. Give it a line number which will make the sentence clear. Let classmates guess the missing verb.

Summary:

1. Why are line numbers used in 10's? (In case of omission of important information we can insert the data in between the sets of 10.

2. What does the computer do with line numbers? (It puts them in numerical order.)

3. What does LIST do? (It displays the program in the computer's memory onto the screen)

4. What does LIST 20-40 do? (It instructs the computer to list lines 20-40 only.)

Exercises:

1. Write a program listing five actors.

2. Write a scrambled sentence by using line numbers in a mixed up order. If you say each word in numerical order does it come out correctly?

3. Run the program to check.

4. Write a program listing your spelling words. Call for numbers 10-15 by keyboarding LIST 10-15.

TOPIC 48
System Commands - RUN, NEW

Aim: How Do We See A Program Work?

Performance Objective: Students will be able to:

. define and apply the following commands: RUN, NEW

Vocabulary: New: RUN, NEW
Review: LIST, PRINT, carriage return

Motivation:

Place the following program on the chalkboard or on an overhead projector:

```
60 PRINT "COMPUTERS"
35 PRINT "DON'T"
55 PRINT "LIKE"
10 PRINT "PEOPLE"
20 PRINT "WHO"
70 PRINT "ARE"
80 PRINT "SILLY"
```

What do you think this program says?

Development:

1. How do we execute a program? (Type RUN and press the carriage return. The program will read "PEOPLE WHO DON'T LIKE COMPUTERS ARE SILLY" one word per line. The lines are shown in numerical order from the lowest to the highest number.)

2. How can we write a new program? (We tell the computer that we want a new program by keyboarding the command NEW and pressing the carriage return.)

3. What happens to the old program when we keyboard in NEW? The old program has been erased from the computer's memory.

4. How can we check to prove that the old program is gone? (Type LIST and press the carriage return. The program will not reappear on the screen.)

Application:

1. Keyboard NEW and press the carriage return. Keyboard in the following program:

```
10 PRINT "LIKE"
20 PRINT "A"
30 PRINT "GENIE"
40 PRINT "I"
50 PRINT "CAN"
60 PRINT "DISAPPEAR"
70 END
```

2. Type LIST. Remember to press the carriage return.
3. Type NEW. Remember to press the carriage return.
4. Type LIST. Remember to press the carriage return.

Summary:

1. What does NEW do? (It erases the previous program from the computer's memory.)
2. What does RUN do? (This command executes the program.)
3. How is RUN different from LIST? (RUN executes the program. The instructions to the computer do not show. Only the messages in the quotation marks appear.)

Exercises:

1. Write a program like the one above.
2. Type LIST.
3. Type RUN.
4. Type NEW.
5. Type LIST.

TOPIC 49
System Command - CLEAR/SCREEN

Aim: How Can We Clear The Screen And Get The Program Back?

Performance Objectives: Students will be able to:

- define the CLEAR/SCREEN command
- analyze and execute the command to discover the results
- compare and contrast system commands

Vocabulary: New: CLEAR/SCREEN (the name is dependent upon the brand of computer
Review: LIST, RUN, NEW, line number

Materials:

chalkboard, chalk, map or construction paper

Motivation:

What are some of the commands we have learned?

What does each one do?

Is there a way we can erase a program from the screen and not have it disappear forever?

Development:

1. Who would like to write his/her name on the board? (Have about five students write their names on the board.)
2. Memorize this list of names in the order in which they were written. (Give students a couple of minutes to memorize the names.)
3. Let's cover the names. (Use a map or a piece of construction paper to hide the list on the board.)
4. Who can recite the list from memory?
5. (Erase the board.) Who remembers the names that were on the board?
6. Even though the board has been erased how many of you still remember the names in the correct order?
7. Who can write them on the board?
8. The CLEAR/SCREEN command on the computer works the same way. It clears the screen but the memory is not erased.
9. What happens when the CLEAR/SCREEN command is used? (The screen clears and the cursor appears in the upper lefthand corner of the screen.)

10. Why would we want to clear a screen? (To execute a program, to list a program from the beginning, to get rid of a full screen of data)

Application:

Write a program that lists the children whose names were on the chalkboard.

List the program.
Run the program.
Clear the screen.
Run it again.
List it again.

Summary:

1. Review LIST, RUN, NEW, CLEAR

2. How is CLEAR different from NEW? (This command clears the screen but not the computer's memory. The command used is different for each computer company.

TOPIC 50
Flowcharts - Sequence

Aim: How Do We Use Flowcharts To Put Events in the Correct Order?

Performance Objectives: Students will be able to:

- recognize logical sequence of events
- draw a flowchart using simple words and pictures
- recognize symbols used in flowcharting
- write a flowchart from picture representations
- use pictures to show the origins of a flowchart
- see the progression from flowchart writing to program writing

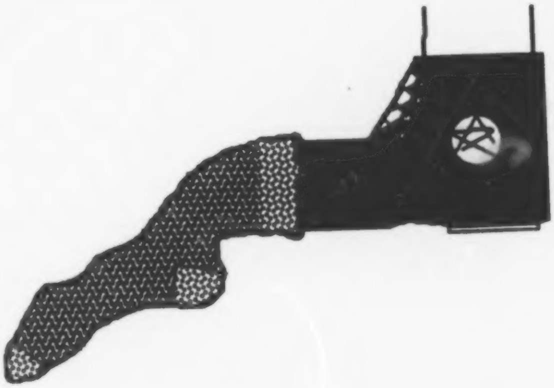
Materials:

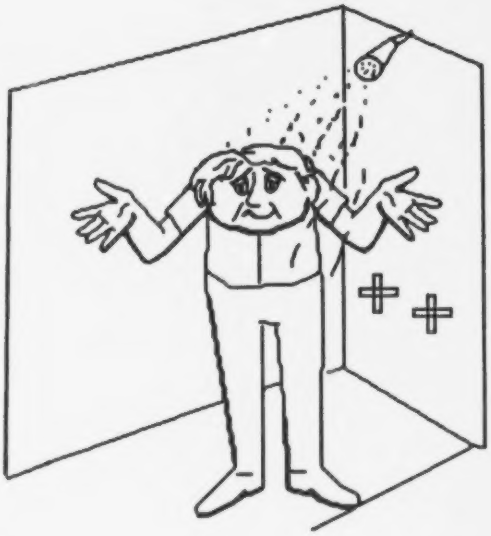
drawing paper, pencils, crayons, worksheets, pictures

Vocabulary: New: sequence, flowcharts, average, oval, rectangle

Motivation:
Worksheets 1 and 2:

What is incorrect in each picture?





Development:

1. Write a list of simple directions that show something you do every day. Pick a topic from the following:
    - getting ready for school in the morning
    - preparing a meal
    - getting dressed
    - playing a game
    - making a birthday card
    - feeding the fish
    - making the bed

2. From this list of directions draw a picture for each step to show the order of events as they occur. This order of events is called sequence.

3. Can you write the steps necessary to complete the task of making a birthday card?

   Worksheet 3:

   1. Get pencil, crayons, paper.
   2. Fold paper
   3. Outline design on paper
   4. Color in design
   5. Write message inside
   6. Sign card with name

4. What is a flowchart and how is it used?

   Flowchart Defined - A flowchart is a road map or drawing of all the steps used to solve a problem. It shows the order of the steps and how each step is connected to the other step.

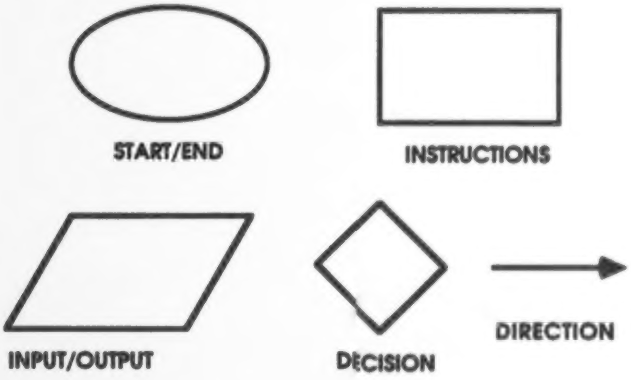
   We start with a list of unordered things to do.

   1. Get up.
   2. Put on shoes.
   3. Go to school
   4. Put on socks.
   5. Eat breakfast.
   6. Put on clothes.

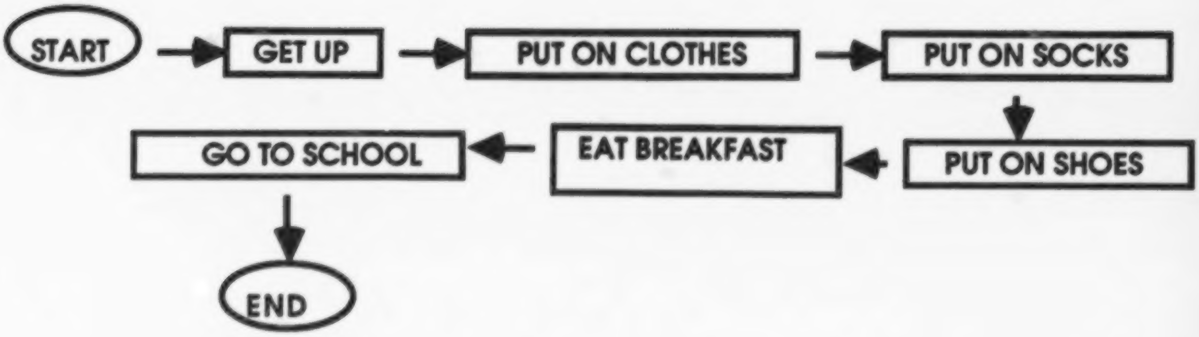
   Put the list in order. (Accept all logical answers.)

   1. Get up
   2. Put on clothes.
   3. Put on socks.
   4. Put on shoes.
   5. Eat breakfast.
   6. Go to school.

   What are the flowchart symbols? (See Worksheet #4)



Can you draw a flowchart showing the ordered steps you took to prepare for school in the morning?



5. How can we write programs using flowcharts where decisions must be made? (If we have learned the IF-THEN statement we are ready for the answer to this question.)

The DECISION (diamond shape)

How do we make ice cubes? Write a list of directions in the correct order.

1. Start
2. Pour water in the tray.
3. Put the tray in the freezer.
4. Wait.
5. Is it ice?
6. Take out the tray.
7. Pour hot water on the tray to loosen the cubes.

Can you draw a flowchart and put these directions in the proper places?

START

POUR WATER IN THE TRAY

PUT THE TRAY IN THE FREEZER

WAIT

IS IT ICE YET?

TAKE THE TRAY OUT OF THE FREEZER

POUR HOT WATER ON THE BOTTOM OF THE TRAY TO LOOSEN THE CUBES.

END

6. Can we write math programs using flowcharts? (If we have been introduced to line numbers, the PRINT statement, and the mathematical operational signs: + add, - subtract, * multiply, / divide, we can solve mathematical problems using flowcharts.)

PROBLEM	FLOWCHART	PROGRAM
4 times 6	START	10 PRINT 4*6
2 plus 5	PRINT THE PRODUCT OF 4 TIMES 6	20 PRINT 2+5
6 divided by 3	PRINT THE SUM OF 2 PLUS 5	30 PRINT 6/3
	PRINT THE QUOTIENT OF 6 DIVIDED BY 3	40 END

Can you draw a flowchart and write a program for the following problems?

PROBLEM	FLOWCHART	PROGRAM
4 + 6		
9 - 2		
8/4		
Add: 34 + 32 + 64		
Subtract: 336 - 292		
Multiply: 46 * 20		
Divide: 56 / 7		
Multiply 15 by 23		
Divide 3 by 4		
Add 26 and 42		
Subtract 238 from 349		

Applications:

1. Write a list of instructions showing how to mail a letter.

2. Draw a flowchart using this information.

3. Draw a flowchart requiring a "yes" or "no" answer to determine the direction which must be taken in order to solve a problem.

4. Write a math quiz, draw a flowchart and write a program for the math test.

Summary:

1. What is a flowchart?

2. What is its purpose?

3. What symbols are used?

4. What does each symbol represent?

5. How do we use a flowchart to write a program?

Exercises:

1. Flowchart the following problems:

   How to make a tunafish sandwich
   How to change a lightbulb
   How to make chocolate pudding (Copy the directions from the chocolate pudding box)

2. Copy a recipe from a cookbook.
   Copy the instructions from a diagram showing how to put something together.
   Draw a flowchart for each of the above.

3. Compare the flowchart for the instructions showing how to put something together with the diagram you copied from.

TOPIC 51
The PRINT Statement in the Program Mode

Aim: How Do You Use the PRINT Statement in the Program Mode?

Performance Objectives: Students will be able to:

- recognize the need for the program mode
- understand the function of line numbers
- understand the function of CLS or HOME in a program
- write a program with PRINT statements

Vocabulary: New: program mode, CLS or HOME, instructions, execute
Review: immediate mode, RUN

Motivation:

If you had your choice what would you rather be, a human being or a computer?

Brainstorm the things students in the class would like to be able to do.

Categorize the items in the list according to:
Can be done by both humans and computers.
Can be done only by humans.
Can be done only by computers.

Which items are unique to computers?
The results should indicate speed, memory, accuracy.

We have seen speed and accuracy demonstrated by telling the computer to display something, such as a name, on the screen in the immediate mode.

There is a program mode which will use the computer's memory to store instructions and then execute them by displaying many lines on the monitor at the same time.

Development:

1. Review the use of the immediate mode. Have students input a three-line message:
   a. How do you tell the computer you want something displayed on the screen? (PRINT)
   b. How do you show the computer what you want displayed on the screen? (quotation marks)
   c. How do you tell the computer to execute your instruction? (press ENTER or RETURN)
2. How do we get the computer to repeat what we have instructed it to do? (type the lines in again)
3. We seem to be doing more work than the computer. A tool, like the computer, should make our work easier.

4. The program mode places the lines of instruction in the computer's memory to be done as many times as we wish until we erase them from its memory.

5. A program is a list of instructions which tells the computer what we want it to do in the order we want it done.

   The computer stores the instructions until told to execute them.

6. Each line of instructions is numbered just as a list of instructions on a chart in our room is numbered.

   (Demonstrate with such a chart, e.g.,
   Spare Time Activities
   How To Use An Activity Card etc.)

7. On our charts we number by ones. Lines in computer programs are usually numbered by tens.

8. The line numbers keep the instructions in order while they are stored in the computer's memory.

9. The computer will execute the instructions in numerical order.

10. The ENTER or RETURN key must be pressed at the end of each line to place it in the computer's memory.

11. Have students rewrite their three-line message written in the immediate mode into a three-line message in the program mode.

    Discuss the order of the statements
    Review the use of line numbers
    Review the use of PRINT and quotation marks
    Review the use of the ENTER or RETURN key

12. To tell the computer to execute this program, type the command RUN and press the ENTER or RETURN key.

13. What do you see on the screen? (the program which was typed in and the execution of that program)

14. There is a way to instruct the computer to clear everything off the screer as the first step in the program.

15. Since you already have your program typed in how can you instruct the computer to do something at the beginning of the program? Remember, the computer will execute the instructions in numerical order.

16. Add a line number less than 10, type CLS or Home and press ENTER/RETURN.

17. RUN the program and compare this display with what had been displayed before.

18. Type RUN several times to confirm that the program is kept in the computer's memory.

19. Discuss practical needs for a program which can be displayed from the computer's memory.

20. Analyze a program line by line to demonstrate the purpose of each part:

`5 CLS`	Which line does the computer do first? What happens on line 5?
`10 PRINT "COMPUTERS"`	Where does the computer go next? What does the computer do on line 10.
`20 PRINT "ARE"`	Where does the computer go after line 10? What word tells the computer what to do?
`30 PRINT "FUN"`	Which is the next line to be executed? What will the computer do on line 30? How do we tell the computer to DO what we have instructed it to do? (RUN)

21. Predict the output of a program that has been listed out of order to emphasize the role of line numbers. For example:

```
 5 CLS

10 PRINT "I LIKE"

20 PRINT "PEAS"

30 PRINT "CARROTS"

40 PRINT "AND"
```

Application:

Direct students to write programs that will do the following:

List the names of the people in their family.

List their names, addresses and telephone numbers.

Write a holiday message with each word displayed on a separate line.

Summary:

1. What are the benefits of the program mode as compared to the immediate mode?
2. What is the function of line numbers?
3. What is the function of CLS or HOME?
4. How do you input a list of instructions in the program mode?

Assignments:

1. Design a flow chart which shows what you do in the morning to get ready for school.

   a. Change the steps in the flow chart into BASIC PRINT statements.
   b. Number the statements so that the computer will display your list in an order which matches the flow chart.

2. Supply each child with a rexo which has each of the four parts of a print statement and its line numbers written in separate boxes.

10	PRINT	" "	HELLO

Direct the children to cut out each part and paste them on a sheet of paper so that a BASIC PRINT statement program is created which matches a sample shown displayed on an accompanying picture of a computer screen.

TOPIC 52
PRINTing - Numbers in Computation -- Identify Arithmetic Operators

Aim: How Can You Use The Computer To Do Arithmetic?

Performance Objectives: Students will be able to:

- identify the four arithmetic operation symbols
- recognize the difference between PRINT with strings and PRINT with numerals
- use the PRINT statement to evaluate arithmetic expressions

Vocabulary: New: arithmetic operation
Review: Arithmetic Logic Unit, ROM

Motivation:

Distribute hand calculators to the children. After an explanation of how to enter an example and ask for an answer, students will present examples to each other for solution on the calculator.

Compare the performance of the calculator with computation by hand. (The former is faster and more accurate. Both use the same arithmetic expressions.)

Tell the children that the computer is also a calculator.
Elicit the aim.

Development:

1. What things have we used the computer to do for us in the past? (to have a sentence or a picture displayed on the screen)

2. How do we tell the computer to display these things on the screen? (with a PRINT statement)

3. How do we show the computer what we want displayed on the screen? (surround it with quotation marks)

4. We can ask the computer to display an arithmetic example in the same way: `PRINT " 3+5= "`

5. We can ask the computer to display an answer to an arithmetic example also. What statement have we always used to ask for a display? (PRINT)

6. PRINT continues to be the statement that asks for a display.

7. Because the computer has an Arithmetic Logic Unit programmed in its ROM, we do not have to tell it what to display - it can calculate by itself.

8. If we type 3+5 on the keyboard, the computer does the calculation in that special part of ROM. The results of the calculation remains in ROM.

9. If we type PRINT 3+5 the computer will display the results of the calculation on the screen.

10. Compare PRINT "I LOVE COMPUTERS" to
PRINT 3+5
as to input and output.

11. Compare 3+5= as a hand calculator input to
PRINT 3+5 as a computer input.

Compare their outputs.

12. What general rules about PRINT statements can we make?

   a. A PRINT statement with quotation marks will display whatever is inside the quotation marks exactly as entered.

   b. A PRINT statement followed by an example which has no quotation around it will display the answer to the example.

13. There are four arithmetic operations. Have them stated along with the symbols used when computation is done by hand or by calculator.

	SYMBOL		
OPERATION	HAND	CALCULATOR	COMPUTER
ADDITION	+	+	+
SUBTRACTION	-	-	-
MULTIPLICATION	x	x	*
DIVISION	÷	÷	/

14. The computer uses the same symbol for addition: PRINT 3+5

15. The computer uses the same symbol for subtraction: PRINT 8-3

16. The computer does not use the same symbol for multiplication.
The computer understands the x as a letter as in the word - exit.
It uses the asterisk * as a multiplication symbol: PRINT 2*3

17. The computer does not use the same symbol for division. The commonly used symbol is not on the keyboard. The computer uses the slash /.
PRINT 8/4

18. Fill in the chart's COMPUTER column.

Application:

1. Complete this chart to show how each example would be input:

EXAMPLE	HAND CALCULATION	COMPUTER STATEMENT
8 PLUS 6		
12 TAKE AWAY 4		
7 TIMES 3		
6 DIVIDED BY 2		

2. Each statement below contains one error. Circle it and rewrite the statement correctly.

```
PRINT 3x6

PRINT 4+2

PRINT 5-2=

DIVIDE 6/2
```

Summary:

1. What symbol does the computer use for each of the four arithmetical operations?
2. What statement tells the computer to display the answer to an arithmetic example?
3. How does a print statement for numbers differ from a print statement for strings?

Assignments:

1. Bring in some math homework examples. Input them into the computer and record the answers on your homework paper.
2. Children work in pairs. One makes up a problem. The other asks the computer to do the problem. Both children record the answer.
3. Children work in teams of three. One child dictates an example. Child two calculates by hand. Child three has the computer do the calculation. Compare for accuracy. Alternate positions on the team.

TOPIC 53
Printing With Calculations Embedded

Aim: How Does The Computer Solve Math Problems Involving More Than One Step?

Performance Objectives: Students will be able to:

- state the order of arithmetic operations
- evaluate arithmetic operations involving more than one operation
- evaluate expressions containing parentheses
- calculate values of arithmetic expressions using the computer
- write their own examples to demonstrate the use of the computer as a calculator

Vocabulary: New: algorithm, order of operations, parentheses
Review: math operation

Motivation:

Recall earlier comparison of hand calculator and computer as tools for calculation.

What might be some practical applications in using these tools?

Ask for some problem situations. For example:

There are 38 children in class 4-219 and 36 children in class 4-225. How many fourth graders are there in the two classes?

What algorithm should be used to find the answer?

How would you write a BASIC statement so that the computer could calculate the answer?

What do you predict the answer will be?

Sometimes we are presented with problems which involve more than one step. For example:

There are four week-ends in February. I earn $12.00 a week-end baby sitting. How much more money must I earn to buy my mother a $50.00 sweater for her birthday?

What algorithms would you use to solve this problem?

Development:

1. How do we ask the computer to display an answer to an arithmetic problem? Re problem 1 in Motivation: form the algorithm 38+36 and express it as a BASIC statement: PRINT 38+36

2. In a two-step problem we can express both steps in one BASIC statement. Re problem 2 in Motivation: PRINT 12*4-50

The computer will always do the math operations in a special order from first to last:

multiplication
division
addition
subtraction

A trick to help you remember this rule of order is the mnemonic My Dear Aunt Sally.

3. Review the symbols * , / , + , - to express arithmetic operations on the computer.

4. Evaluate each expression using pencil and paper. Then use the computer in the immediate mode to check your results:

   47+23
   8x42
   3x6-2x8
   6+9-3
   7x2-1
   3+5x4
   24/6
   15+ 12/2
   12-2x6
   23-16 +2

   If you find discrepancies between your answers and those of the computer, check the My Dear Aunt Sally rule.

5. We can tell the computer to use a different order of operation by using parentheses around the numbers we want calculated first: (4+2)*3

   Here the addition will be done first.

6. Now the order of operations has been changed - first parentheses, then multiplication, division, addition, subtraction.

7. Evaluate each expression using pencil and paper. Then use the computer in the immediate mode to check your results.

   3+6*8/4
   (3+6)*8/4
   3+(6*8)/4
   3+6*(8/4)

   If you find discrepancies between your answers and those of the computer make sure that you did the operations in the parentheses first, then follow the My Dear Aunt Sally rule.

Application:

1. Express each example as a BASIC statement which is asking the computer for an answer:

```
          2+4*2                         (3+5)*3
          2+4/2                         5*(12-10)
          8-6+1                         20-(10/5)
          8+6-1                         18/(7+2)
```

2. Predict the output of each statement. Check your predictions on the computer.

```
PRINT 15-7*2             PRINT (15-7)*2
PRINT 20+10/2            PRINT (20+10)/2
PRINT 17-8+2             PRINT (17-8)+2
PRINT 3*6+2              PRINT 3*(6+2)
PRINT 36/4+5             PRINT 36/(4+5)
```

Summary:

1. What is the order in which arithmetic operations are executed on the computer?

2. How do parentheses effect this order of operation?

3. How do you use a BASIC statement to ask the computer for an answer to an arithmetic example?

Assignments:

1. Design a poster explaining the My Dear Aunt Sally rule.

2. Create a new mnemonic which will include parentheses to help a person remember the order of math operations.

3. Write three two-step math problems.
   Write the algorithms for each
   Write the BASIC statements for each.
   Predict the computer output
   Check your prediction on the computer.

TOPIC 54
The Monitor as a Grid, Space as a Symbol

Aim: How Can We Plan A Graphics Display For The Monitor Of The Computer?

Performance Objectives: The students will be able to:

- understand the concept of a grid as it applies to the computer monitor
- know the dimensions of their monitor
- understand that only one character can fit into each box on the grid
- understand that every key, including the space bar, represents a character

Vocabulary: New: grid, dimensions, character, cursor, prompt

Motivation:

Computer programs may be replacing textbooks. In some ways they are alike and in some ways they are different. Discuss the comparison. If the title page is not mentioned, interject:

Why is a title page important?

Why should it be attractive in appearance?

Shouldn't you have a title display for your program?

Let's see how it can be done?

Development:

1. Have a demonstration grid chart before the class.
2. Define grid.
3. Explain that the face of the monitor has lines which make boxes just as on the chart, but those lines are invisible.
4. Whenever a key is pressed a character goes into a box.
5. The cursor shows which box will be filled. It moves from box to box.
6. Only one character can fit into a box. (Illustrate with the musical chairs game - only one child can sit on a chair.)
7. Every model of computer has a grid of different dimensions.
8. Find the dimensions of your computer's grid. Have the students press the space bar and count the number of spaces across on each line (e.g. Radio Shack model 4 has 80 spaces per line.)

   Next clear the screen and have the students press the RETURN or ENTER key and count how many prompts they see before scrolling starts (e.g., Radio Shack model 3 has 16 lines.)

9. On the demonstration grid illustrate the dimensions of the grid.

10. Write a name or phrase on the grid to emphasize the one character, one box concept. Include a space between words.

11. Show the class an example of titles and credits arranged on a grid. Reinforce one character, one box and a space is a character.

Application:

1. Distribute graph paper to each child. (Grids of 1/2 squares will be easier for them to work with.)

2. Fold back a strip ten boxes wide along the left side.

3. Plan and execute a layout to fit on your computer's monitor for the opening frame of a computer program (perhaps one already recorded by the child on cassette or disk.)

   Subtract the ten boxes folded back from the total number of boxes you may use on your grid.

Summary:

1. How is the computer monitor like a grid?

2. What are the dimensions of the monitor of your computer?

3. What is the relationship between the key on the keyboard and the grid of the monitor?

Assignments:

1. What other kinds of displays besides title screens could be planned on a grid?

2. The grid is a measuring device. List other measuring devices which can be used to plan the layout of a display. How are they different from a grid?

TOPIC 55
Programming a Graphic - The PRINT Statement HOME/CLS

Aim: How Can We Display a Graphic on the Computer Monitor?

Performance Objectives: Students will be able to:

- recognize the PRINT statement as the means for displaying graphics on the monitor
- program the graphic
- print blank lines where necessary
- eliminate excess display

Vocabulary: Review: PRINT, HOME or CLS, line numbers, quotation marks program, grid

Motivation:

Children share their completed layouts of title screen.
Now we must prepare them for input into the computer.

Development:

1. How do we tell the computer to display something on its monitor? (PRINT)

2. How do we show the computer exactly what we want displayed? (surround it with quotation marks)

3. How do we tell the computer there will be a list of things we want displayed? (line numbers)

4. These instructions to the computer are called a program.

5. We must tell the computer each line we want displayed, in its correct order.

6. On each of the completed grids, unfold the ten box strip along the left-hand side.

7. We now have room to write our instructions for each line we want displayed on the screen. Illustrate on the demonstration grid.

8. Using line numbers and PRINT statements write the program, for example:

```
10 PRINT "   The"
```

Caution: At least one space must be left to accomodate future line numbers of 100 or greater.

9. The quotation marks surround whatever will be displayed including empty spaces.

   In a graphic the quotation marks serve as a picture frame.
   To have a straight frame, all quotation marks on the left-hand side must be one under the other.

10. Since you will want only your graphic displayed on the screen you must instruct the computer to remove everything that is on the screen before displaying the graphic.

    What is on the screen before you run the program? (the program you wrote.) Illustrate by running the program.

    Use the CLS or HOME command to tell the computer to erase the program from the screen before it displays the graphic.

    Since the computer must clear the screen before displaying, use a line number which will instruct the computer to do that first.

    (After adding the appropriate line illustrate by running the program again and comparing it to the program run without CLS or HOME.)

11. If your grid has some lines with only empty boxes, do you want those lines displayed? (Yes, because they create the spacing over the monitor. If you didn't have them all the lines would be right under the other.) Illustrate by running a program where the blank lines have been eliminated.

12. The empty line is a blank line or a skipped line.

13. You must tell the computer to print an empty line at the correct place.

    The line number tells the place.
    PRINT tells it to put it on the screen.
    Quotation marks tell it what to put on the screen; in this case empty boxes. Which key creates empty boxes? (Space bar)

    ```
    e.g.  70 PRINT " "
    ```

<u>Application</u>:

1. Write the program which will tell the computer to display your graphic on the monitor.

   Input the program and run it.

Summary:

1. How is a computer instructed to display a graphic on its monitor?
2. How can blank lines be inserted into a program?
3. How can excess material be removed from the monitor before a program is run?

Assignments:

1. Investigate the possibility of saving this graphic on the disk or cassette which has the program it describes. Can it appear on the monitor to introduce the program? What changes, if any, must be made?
2. The quotation marks on the left must be in a straight line in order that the graphic not be distorted. Why is it not necessary for the quotation marks on the right to be in a line, one under the other?

TOPIC 56
Graphics Via the PRINT Statement - A Realistic Picture

Aim: How Can You Get a Picture Displayed on the Computer's Monitor?

Performance Objectives: Students will be able to:

- use the dimensions of the monitor's grid effectively
- design a realistic picture to be displayed on the monitor
- write a program using PRINT statements for output

Vocabulary: keyboard character, grid, PRINT, CLS or HOME

Motivation:

Before class begins load some programs into the computer which display a picture, e.g., sailboat, ice cream cone. Children share impressions.

Discuss the possible ways in which these pictures were made.

Development:

1. Using a demonstration grid hung in front of the class, review the relation of:
   That grid to the monitor of the computer
   Each keystroke to each box on the grid
   A PRINT statement to getting what is on the grid onto the monitor

2. On the grid the teacher will outline a picture of the object which the children had seen earlier on the computer monitor (see Motivation.)

   Point out that the lines must be drawn inside the boxes and not along the lines already imprinted to make the grid.

3. Here is a nice picture shown on the grid.

   Is it too wide for display on the monitor? How do you know?
   Is it too long for display on the monitor? How do you know?
   Can we use keystrokes to tell the computer what we want printed on the screen?

4. The lines we use to draw on this grid cannot be found on the keyboard. To get something printed on the screen we must use characters that are on the computer's keyboard.

5. You may use any characters on the keyboard; letters, numbers, symbols, spaces, except quotation marks, to help create your picture.

6. The character you choose will fill a whole box and only one character can go into any one box.

7. Teacher illustrate by super-imposing a keyboard character over the outline drawn on the demonstration grid. Be sure each character fills the box and no character overlaps a grid line.

8. Elicit from the class what must be added to this graphic to have it displayed on the monitor.

Write the PRINT statements necessary to the left of the graphic using one box for each character in the statement.
Emphasize the need for a straight frame around the picture - check that left quotation marks are in the same column.

Have children report their deductions as to why it is unnecessary for the right quotation marks to be aligned in the same column. If none are correct, teacher will explain.

9. Have a child add a program line with a command which will ensure that only the graphic and not the program will be displayed on the screen.

Application:

1. Distribute graph paper.

2. Have children:

   a. fold back ten columns of boxes on the left.
   b. draw an outline of a simple object (brainstorming will generate a list of suggestions.)
   c. fully cover any box having part of the outline in it with a character from the keyboard. Choose characters whose contours enhance the graphic.
   d. make slight adjustments to the shape, where necessary, by moving character positions.
   e. unfold the left side of the paper and write the program which will get this displayed on the monitor.

3. Input the program into the computer.

4. Run the program. Make any adjustments that are necessary.

Summary:

1. How can a realistic picture be designed for display on a computer's monitor?

2. How can the computer be instructed to display this picture on its monitor?

Assignment:

1. Save your graphics program on tape or disk.

2. Add some statements to your program to make the picture move.

3. Prepare a Graphics Gallery Art Show to share with other classes and/or parents made up of the programs of your classmates.

4. Create a graphics program for a picture which is displayed in solid shapes instead of outline.

TOPIC 57
Numeric Variables

Aim: How Can Values Be Stored in RAM?

Performance Objectives: Students should be able to:

- define a variable
- use a BASIC statement to fill a memory location
- use the LET statement in simple arithmetic statements
- identify allowable numeric variable names

Vocabulary: variable, numeric variable, accessed

Motivation:

Understanding computers is sometimes a matter of understanding initials

MATCH: The initials with the computer term

RAM	Beginners All Purpose Symbolic Instructional Code
ROM	Central Processing Unit
CPU	Random Access Memory
BASIC	Read Only Memory

Development:

1. What is the difference between the RAM and the ROM?
The RAM and the ROM are both part of the computer's memory. The RAM (Random Access Memory) is the memory that we can assign values to and the ROM (Read Only Memory) is the portion of the memory which translates BASIC programs so the computer understands them. The RAM is the portion we can learn to manipulate and change, that is, access.

2. How can we describe the RAM memory ?
The RAM can be thought of as a series of memory locations (boxes) which can be named and assigned a value. A specific location in this memory is called a variable. The value of this variable, or what is stored at this memory location, can change (vary) and when the computer is turned off all information stored here is erased. This memory is volatile.

3. How can numeric information be stored in the memory locations in the RAM?
One method to store numeric data (numbers) in the RAM is to use a LET statement. A LET statement allows the variable or memory location on the left side of the equal sign take on the value on the right side of the equal sign. For example:

```
10 LET A = 20
```

As a result of this LET statement a memory location called A will take on the value 20.

A memory location or variable may be given a name composed of a single letter (A-Z), two letters or a letter and a number.

Activities:

1. Have students play computer. Tape a number of envelopes on the chalkboard. Label this collection "MEMORY". Explain to students that the envelopes represent memory locations which can be named and filled using the correct LET statement.

   Student volunteers should be given an index card on which they can write any number they choose. The students should be allowed to come to the board and write the appropriate LET statement which would assign the number on the index to a memory location (an envelope). If the statement is written correctly using a legal variable name, allow the student to go to one of the envelopes, write the name on it and put the index card inside the envelope.

   Reinforce learning by having students write a PRINT statement using the variables they created or predict the result of adding two variables together.

2. Ask students to bring in egg cartons. Have students use the letters A-L to name the different compartments of the carton which represents the computer's memory. Next take 12 small scraps of paper, write a number on each and place one in each compartment. Now ask students to write a program using LET statements which would accomplish this.

3. Draw four memory boxes on the chalkboard and have student volunteers fill the boxes as per the following program:

```
10 LET A = 1
20 LET B = 2
30 LET C = 3
40 LET D = A + B + C
50 PRINT D
```

4. Have students predict the output of the following programs:

```
PROGRAM # 1         PROGRAM # 2        PROGRAM # 3
10 LET A = 10       10 LET A = 5       10 LET A = 0
20 LET B = 20       20 PRINT A         20 LET B = A + 1
30 PRINT A ,B       30 LET A = 6       30 LET C = B + 1
40 LET A = 20       40 PRINT A         40 LET D = C + 1
50 LET B = 30                          50 LET E = D + 1
60 PRINT A,B                           60 PRINT A,B,C,D,E
```

5. Have students write a program that will place the age of each person in their family in a numeric variable and compute the total of all these ages.

TOPIC 58
Programming Errors

Aim: How Do We Determine Where Errors Exist Within a Program and How Do We Correct Those Errors?

Performance Objectives: Students will be able to:

. define syntax error
. identify and correct syntax errors which occur within a program
. identify and "debug" syntax errors which occur within a program

Vocabulary: syntax error, debugging
PRINT, LET, string variable, numeric variable

Motivation:

- Examine the following programming statements. Determine if each programming statement is correct. If it is not correct, rewrite the statement correcting it.

```
10 LET X = 4          (correct)
20 X + 7 = Y          (incorrect, Y = X +7)
30 PRMNT Y            (incorrect, PRINTY)
40 END
```

- Type in the program as it exists. After the program has been typed in, RUN the program. What happens? (the computer will not execute the program and instead states that there is an error and indicates on what line the error occurs.)

Development:

1. What happened when the program was run? (the computer said that an SN error occurred in line 20) Let us examine line 20. Line 20 states:

```
20 X + 7 = Y
```

Why would the computer indicate that an SN error exists on that line? Review the LET statement, stressing that the new variable name is always written first, followed by an equal sign and finally by the value which is to be assigned to that variable.

Stress that line 20 is incorrect because the new variable name "Y" must be written first, followed by the value assigned to Y,--- X + 7 .

2. This is a type of SN error.

Let us rewrite the program, correcting line 20 as we proceed. We will type the program in as follows:

```
10 LET X = 4
20 Y = X + 7
30 PRMNT Y
40 END
```

We know that line 30 is incorrect also. Why? (PRINT is misspelled.) Do you think the computer will accept line 30 as it is written or will the computer reject line 30 and say that there is an error?

RUN the program and find out what happens.
(The computer will state SN error in line 30)

Why does an SN error occur in line 30? (The computer does not recognize PRMNT as a legal command and as a result does not know what to do with line 30.)

What should line 30 state? (30 PRINT Y)

3. Now, let us rewrite the program again correcting line 30. The program should now be typed in as follows:

```
10 LET X = 4
20 Y = X + 7
30 PRINT Y
40 END
```

What happens when the program is RUN? The computer will output the following:

```
 11
READY
```

What does this mean?

Review the fact that the term READY indicates to the user that the computer is ready for instructions. The computer has completed its given task and is now awaiting further instructions or new instructions from the user.

4. We have now seen two different errors that are both called SN errors.

What do you think an SN error is?
An SN error, or SyNtax error is an error caused by a mistake in the way a command or information is given to the computer. Each programming language has its own structure which must be followed. If the structure is not followed, the programmer has made a syntax error.
Line 20 contained a syntax error because the structure of the line was incorrect.

Line 30 contained a syntax error because the command was misspelled.

5. Pretend you are a computer. Examine each line of the following program. If there is a SyNtax error in the line, place a star in front of the line number and circle the error. Once you have found the error, "debug", or correct the error.

```
10 X = 4
20 Y = 12
3B N$ = "Jane"
40 A$ = Mary            (40 A$ = "MARY")
50 X + Y = Z            (50 Z = X + Y)
60 PNRIT Z              (60 PRINT Z)
70 Print A$ + N$
80 EDN                  (80 END)
```

6. Now, type in the original program, mistakes included. After it is typed in, RUN the program and see if you found the first error.

   We corrected the errors by retyping the entire program. Is that the only way to correct errors? Must the whole program be retyped in order to correct a mistake, or is there a faster way?

   Elicit from the children the fact that errors in a line may be corrected by retyping just the line that contains the error.

   If we wish to correct line 40 there is no need to retype lines 10 to 40. We may retype just line 40 in its entirety.

   Have the class retype line 40, ENTER it and then RUN the program. What will happen? (The next syntax error on line 50 will be noted on the screen.) Correct the errors on line 50, RUN the program again and determine what occurs. Continue to edit each line that contains an error by retyping the specific line.

Applications:

1. You have just finished writing the following sentences but have found that you made mistakes. Circle each mistake and rewrite the sentences correctly:

   1 Prnmt the mane of yuor fatheer.
   2 Hwat si your adres
   3 Tday is friday.

Summary:

1. Does the computer know when a mistake is made in programming?

2. What type of error do we know the computer recognizes?

3. What is a Syntax error?

4. How may we correct errors within a program?

5. How might we correct a single line of a program without retyping the entire program?

Activities

1. Make a poster illustrating the different types of syntax errors that you have encountered.

2. Write a program that will take the numbers 7 and 11 and will determine the answer when you add, subtract, multiply and divide them. When you write the program, include some incorrect lines and see if the computer will notice the error. If the computer does, then edit the line in question. Then, see if the program's output corresponds to what it should be. If it does not, debug the program so that the output is correct.

3. Examine the following program. Pretend you are the computer and locate all syntax errors.

```
10 CLS
20 PRNTT " XXXXXX"
30 X = 4
40 "PRINT"-4-4-4-4-4-
50 X - 4 = B
60 B= "9"
70 EEND
```

TOPIC 59
Remark

Aim: How Is a Rem Statement Used?

Performance Objectives: Students will be able to:

- understand the function and use of the Rem statement
- understand the importance of the Rem statement
- use the Rem statement to identify portions of simple programs and to use in creating documentation
- use the Rem statement for titles and credits

Vocabulary: New: Rem - stands for Remark, documentation, titles, credits

Motivation:

Let's take a look at this program:

```
10 Let A=2
20 Let B=4
30 Let C=A+B
40 Let D=C/2
50 Let E=D-2
60 Print E
```

What does this program do? (It adds two numbers, divides the total by two, subtracts two from the answer and then prints out the result.)

How could we make the program easier to understand? (Add print statements that explain each step.) For example:

```
25 Print "adding A and B gives C"
```

Sometimes we don't want or need all of those print lines in our output.

Development:

1. What else can we do beside using the PRINT statement so often? (We could add programmer's comments or remarks that don't appear in the output.)

2. Rem - stands for Remark. It is never really executed.

3. Let's go back to our program with all of the print lines.

   a. How do we change these to Rem statements? (We retype the lines to take out print and the quotation marks, and we add Rem as the first word.)

   b. Change the first PRINT line.

   c. Run the program and compare the output to the earlier program.

   d. Change any other print lines that are unnecessary to the user but essential to the programmer.

Example:

```
5 Rem Add, Division and Subtraction
10 Let A=2
20 Let B=4
25 Rem C equals A and B
30 Let C=A+B
35 Rem D equals C divided by 23
40 Let D=C/2
45 Rem E equals D minus 2
50 Let E=D-2
60 Print E
```

4. Why are Rem statements, or program documentation, necessary to the programmer?

   a. To understand what is happening step-by-step.

   b. To alert another programmer to the purpose of each section.

   c. To see the relationship of each part of the program to the others.

   d. To make modification of program lines easier.

   e. To understand the logic and sequence of the program.

5. In professional programs, the programmer begins by stating the title and function of the program and his/her own name or company.

   a. How would you do this?

   b. What happens when you need several lines in a row? (Each line must be numbered and start with Rem.)

   c. What effect do these lines have on the way the program runs? (None)

<u>Applications</u>:

1. Add a title, function, and your name to the program we've been using.

2. Give two situations in which you would use the Rem statement.

3. What do these Rem statements do?

```
10 Rem Program #7.  Written by
20 Rem Jane Doe on May 3, 1984

70 Rem X is the number of
80 Rem rainy days this month

50 Rem C is the sum of A and B
30 Rem the answer will be shown
40 Rem by the following method
```

4. Write Rem statements for this program:

```
10 Rem
20 Rem
30 Print "Good Morning"
40 Rem
50 Print "How are you?"
60 End
```

Summary:

1. Why is Rem important?

2. How can we use the Rem statement?

Assignments:

1. Write a program with documentation for a list with your name, classes and teachers.

2. Write a program that displays the output below. Use Rem statements. Print statements and blank lines.

```
Report Card
Your name
Your address
Your city, state and zip code

Subject             Mark

English              80
Math                 75
S.S.                 75
Science              80

The average is 77.5
```

3. Make corrections in these programs:

```
10 MY VERY OWN PROGRAM
20 LET A = 10
30 LET B = 3
40 LET C = A-B
50 PRINT C

THIS PROGRAM MULTIPLIES ONE NUMBER
BY ANOTHER.  I WROTE IT FOR HOMEWORK.
20 X=5
30 Y=2
40 Z=X*Y
50 THE SOLUTION TO X TIMES Y
60 PRINT Z
```

TOPIC 60

RAM and ROM as Programming Devices

Aim: How Does The Computer Process Information?

Performance Objectives: Students should be able to:

- distinguish between the RAM and the ROM memories
- define binary numbers
- the sequence which converts BASIC into a language which the computer understands

Vocabulary: RAM, ROM, CRT, Input, Output, Process, CPU, Access, data, volatile, compiler, binary code

Motivation:

Children love decoding messages. Provide students with a simple alphabet number code such as: A-1, B-2, C-3, D-4, E-5, F-6, G-7, H-8, I-9, J-10. Next provide students with mystery words such as " 2 9 7" and have students use their code as a means of deciphering the code. In this case the word would be "BIG".

Explain to students that in a similar but much more complicated manner the computer uses a number code for what is input.

Development:

1. How does a computer get information into its memory?

   No matter what kind or size of computer, in order for it to do anything it is necessary to put something into its memory. This process is known as INPUT.

   Input can be carried out using a cassette tape or a diskette on which data was previously stored or simply using the keyboard. The most commonly used input devices are: cassette tapes, diskettes and the keyboard.

2. What are the parts of the computer's memory?

   The computer's memory lies beneath the keyboard. Once data is entered it is electronically stored on integrated circuits commonly called chips or micro-chips.

   The data is stored at a particular part of this memory called the RAM - the Random Access Memory. This is the portion of the memory which the computer user can access - get to and alter. Data can be added to and erased from the RAM. When you type in a BASIC program it is stored in the RAM. It is important to note that the RAM is "volatile." That is, it changes easily and when the computer is shut off the RAM is erased. It is therefore wise to store any important data on a outside memory device (diskette or tape) before shutting off the computer.

The second main portion of the computer's memory is the ROM memory - the Read Only Memory. This memory can only be read and cannot be accessed or changed. The ROM contains the compiler, or interpreter. The compiler acts as a translator changing BASIC, a computer language people understand, into binary code, i.e., a numbering system based on 0's and 1's. Every letter or number which is input to the RAM is converted by the ROM into a sequence of zeroes and ones. (See activity # 5). It is important to note that there are a number of different binary codes. The one used by most computers is the American Standard Code for Information Interchange - simply known as ASCII. Once this translation is completed the actual work (Processing) is done by another series of chips known as the Central Processing Unit or simply the CPU.

3. How does data get out of the computer?

The process of getting information or data from the computer is known as OUTPUT. There are basically two ways to get output. They are on the screen called the CRT (Cathode Ray Tube) or by using a printer.

Activities:

1. Have students create posters which illustrate not only the parts of the computer but the functions of the keyboard, RAM, ROM, CPU, CRT, and printer.

2. Have students engage in a creative writing exercise in which they explain what they understand the role of a particular computer component to be. For example, "MY LIFE AS A CPU".

3. Ask students to write a computer play in which each student role-plays the function of the component. Characters might include: Mr. CPU, Ms. ROM, Sir RAM.

4. Ask students to form cardboard boxes or small models of microcomputers including a key to explain what each part of the model does.

5. Binary Code Translation - give students riddles in binary code and ask students to decode the riddle and answer the riddle. (Provide students with the binary code.)

TOPIC 61
String Variables

Aim: How Can Words Be Stored In The Computer's Memory?

Performance Objectives: Students should be able to:

- define a string variable
- use a LET statement to place a string in RAM between numeric and string variables.
- use string variables in programs.

Vocabulary: variable, string, numeric, data, RAM

Motivation:

Conduct a class "data hunt". Explain to class that data is all around us. Data is in our homes, our school - all over the world. Data is information of any kind - numbers, names, dates, addresses, etc.

The class data hunt should generate a data list from all over the classroom. (See Activity #2).

Development:

1. What is a string variable?

   A string variable is memory location in the RAM (Random Access Memory) which is used to store a string, i.e., letters, words, sentences etc. Numeric variables hold numbers, string variables hold any data other than numbers.

2. What kind of data should be stored in a string variable?

   Any data that is not solely numeric must be stored in a string variable. This would include letters, words, punctuation marks, and even mixed data such as a date, e.g., 7/18/84. Numeric variables hold only numbers. As soon as a symbol is introduced into the data it has to be stored as a string.

   For example 9384 can be stored in a numeric variable but 9,384 must be stored as a string because the comma was included. The number 10.80 would be numeric because a decimal point is part of a mathematical system but $10.80 must be a string because of the dollar sign.

3. How is string data stored in the RAM?

   One way to store string data in the RAM is to use a LET statement. A LET statement assigns a particular piece of data to a particular location in the RAM - the computer's memory. The location is identified by a variable name.

For example:

```
10 LET A$ = "apple"
```

This statement simply indicates that in a memory location identified as A$, A$ should take on the value apple. If later in the program this line is executed:

```
20 LET A$ = "orange"
```

the portion of the memory identified as A$ will take on the value orange. In other words the location named on the left of the equal sign takes the value on the right of the equal sign.

String variable names may be a single letter (A-Z), two letters, or a letter and a number. It is very important to note that whatever name is chosen, it must be followed by a $ which is the symbol to the computer that string data is to be stored. The $ is therefore a very important part of the string variables name. Also it should be noted that the string data being assigned by the LET statement must be enclosed in quotation marks.

4. What can be done with data stored in string variables?

The data in string variables can be used in a variety of ways, the most obvious of course is to PRINT it.

For example:

```
10 LET A$ = "TODAY "
20 LET B$ = "IS A "
30 LET C$ = "GREAT DAY"
40 PRINT A$;B$;C$
```

The output would be: `TODAY IS A GREAT DAY`

Activities:

1. Have students play computer. Tape a number of envelopes to the chalkboard under the label "MEMORY". Explain to students that the envelopes represent the computer memory locations that can be filled. Ask student volunteers to write a word on an index card and then come to the chalkboard and write the LET statement that would put this word in the memory (Words can be taken from spelling and vocabulary lists). If the LET statement is written correctly, have the student go to the memory and label an envelope and put the index card inside. Continue until the memory is filled.

   Reinforce by dividing the class into teams and ask team members to write PRINT statements using these variables to create meaningful sentences.

2. Use the classroom data list generated in the motivation and have the class categorize each item as string or numeric data. Write the appropriate LET statements for each.

3. Create a student questionnaire:

NAME
ADDRESS
AGE
TELEPHONE
GRADE
WEIGHT
HEIGHT
SEX

Once students have completed their questionnaire, have students write a program to assign this data to memory using LET statements. Before doing this discuss the data and decide whether each item should be stored as a string or numeric data.

4. Use string variables to reinforce other subject areas:

LANGUAGE ARTS:

Instruct students that - A1$, A2$, A3$ should be adjectives, N1$ and N2$ should be nouns, V$ should be a past tense verb and P$ should be a preposition.

For example:

```
10 LET A1$ =" QUICK"
20 LET A2$ =" BROWN"
30 LET A3$ =" LAZY"
40 LET N1$ =" FOX"
50 LET N2$ =" DOG"
60 LET V$  =" JUMPED"
70 LET P$  =" OVER"
80 PRINT "THE";A1$; A2$; N1$; V$; P$; "THE"; A3$; N2$
```

SOCIAL STUDIES: Have students try a program similar to this:

```
10 LET C$ =" ALBANY "
20 LET S$ = " NEW YORK "
30 PRINT "THE CAPITAL OF";S$;"IS";C$
```

SCIENCE: Have students try a program similar to this:

```
10 LET A$ = "WATER"
20 PRINT "TO LIVE PLANTS NEED"; A$
```

TOPIC 62
Math Exercises With String and Numeric Variables

Aim: How Can a Computer Be Used To Solve Mathematical Problems?

Performance Objectives: The students should be able to:

- use string and numeric variables to solve math problems
- identify the BASIC symbols used to do mathematical operations

Vocabulary: string, numeric, data, RAM

Motivation:

In checking the previous night's math homework, explain to the students that the assignment will be scored by computer. However in order to do this we must rewrite the math problems in BASIC, the language that the computer understands.

Development:

1. What mathematical operations can the computer perform? The computer can do all mathematical functions.

   The only difference is in the symbol or sign it uses to show some operations.

MATH OPERATORS	BASIC OPERATORS
+	+
-	-
x	*
+	/

2. How must math problems be written so the computer can understand and solve them?

   SAMPLE MATH PROBLEM

   108
   -36

   ———

   The first step in solving a math problem on the computer is to express the problem all on one line, e.g., 108-36. Once the problem is expressed the correct way, there are a number of different methods to use to solve it:

   Method 1 - This will print only the correct answer:

```
10 PRINT 108-36
```

   Once this statement is executed by typing RUN, the output will simply be the answer 72.

Method 2 - This method will store the numbers in numeric variables and do the operations using memory locations.

```
10 LET A =108
20 LET B = 36
30 LET C = A-B
40 PRINT C
50 END
```

Method 3 - This method is similar to method 2 but instead of storing the difference in the memory, it is simply printed.

```
10 LET A = 108
20 LET B =  36
30 PRINT A-B
40 END
```

Method 4 - All previous methods printed simply the answer but this method prints the problem and the answer.

```
10 LET A=108
20 LET B=  36
30 LET C= A-B
40 PRINT "108 - 36 =" C
50 END
```

Note: that in line 40 the problem is enclosed in quotes because we want the computer to print it here. The actual solution takes place in line 30.

Method 5 - The equation can be printed using a string variable:

```
10 LET P$ = " 108-36 = "
20 LET A= 108
30 LET B = 36
40 LET C = A - B
50 PRINT P$;C
60 END
```

Activities:

1. The students can convert math homework problems into programs and then RUN to see if the computer agrees with their answer. Note: The teacher should tell children to make the teacher aware of any disagreement between the child's answer and the computer's.

2. Encourage the children to give the computer some challenging math problems. Warn children to be careful that the answer does not exceed 16 digits otherwise the computer will put the answer into scientific notation.

3. Have children work in pairs - one child composes the math problem while the other keys in the program. Both check the computer's answer.

4. Have students write a program to determine how many students are present in class. Teacher must of course provide the register and absentee totals to students.

5. Have students write a program that will output the twelve times table.

TOPIC 63
Print Format

Aim: How Can We Get The Computer To Print In Different Ways?

Performance Objectives: Students should be able to:

- use the PRINT statement
- use the comma, semi-colon and TAB in PRINT statements

Vocabulary: semi-colon, comma, format, TAB

Motivation:

Try a different approach to the daily experience chart. Instead of writing the paragraph in the ordinary manner on the chalkboard, have students express their contributions to the paragraph in BASIC PRINT statements. RUN the program and have students note the output which will be one sentence under the other with each sentence beginning at the left hand margin. Elicit student criticism of this output and begin a discussion of how we can alter the output.

Development:

1. How can we use punctuation marks to control the computer's output?

   Generally speaking if a PRINT statement does not have any punctuation marks at the end of the line, the output will begin at the left hand margin of the screen, print the message and move to the left hand margin on the next line.

   For example:

```
10 PRINT "We"
20 PRINT "Speak"
30 PRINT "BASIC"
40 PRINT "Here"
```

   The output would be:

```
We
Speak
BASIC
Here
```

   In order to control this movement from line to line we can use a comma or a semi-colon at the end of the PRINT statement.

   If a comma was placed at the end of each line in the above program, the output would look like this:

```
We              Speak              BASIC              Here
```

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The comma instructs the computer to continue its output on the same line in the next print zone. (Note: The number of print zones and the length of each zone varies with each computer system. Check your owner's reference manual to get this information.) If there aren't any more print zones on that line the computer will then move to the next line and begin printing at the first position of the first print zone.

If a semi-colon was placed at the end of each line in the above program, the output would look like this:

```
WeSpeakBASICHere
```

The semi-colon instructs the computer to continue printing on the same line directly after the previous print without leaving any spaces. As a result of not allowing for any spaces in the program, the output will appear all run together. To avoid this, one simply has to leave a space before the word to be printed in each PRINT statement. The space must be within the quotation marks, e.g., 10 PRINT " We"

2. How can we use PRINT TAB to control printing?

The PRINT TAB statement is another method which can be used to control printing. Using the PRINT TAB, the output can begin at any point on a line. The position to begin the printing is expressed as a number of positions from the left hand margin.

For example:

```
10 PRINT TAB(5)"HERE"
```

This statement will cause the computer to tab over 5 spaces from the left hand margin before it begins printing.

(Note: It is important to note that on many systems no space is permitted between the keyword TAB and the parentheses. Also there is usually a maximum value that the number within the parentheses can have. This maximum value varies with the system and the reference manual should be checked.)

Activities:

1. Using the program developed during the motivational activity, add semi-colons to the end of each PRINT and have students note the results.

2. Try using semi-colons to print words from different PRINT statements. This activity works well as a reinforcement for spelling words.

For example:

```
10 PRINT "f";
20 PRINT "a";
30 PRINT "c";
40 PRINT "e";
50 END
```

3. Using the method described in #2 have students work in pairs. One thinks of and writes a program to print it with one or more letters missing. The other student guesses at the missing letters.

   For example :

```
10 PRINT "H";
20 PRINT "A";
30 PRINT "P";
40 PRINT "-";
50 PRINT "Y"
60 PRINT "WHAT IS THE MISSING LETTER"
```

4. Have students convert math problems into PRINT statements which will display the problem and use the computer's ability to calculate the answer.

   For example :

```
10 PRINT " 8 + 4 = ";
20 PRINT   8 + 4
30 END
```

5. Ask students to write a program to display their name, date of birth and age in columns across the screen.

   For example:

```
10 PRINT " EILEEN",
20 PRINT " 7/26/74",
30 PRINT " 10"
```

6. Have students try this program to see the different PRINT TAB positions:

```
10 PRINT TAB(1) "*"
20 PRINT TAB(2) "*"
30 PRINT TAB(3) "*"
40 PRINT TAB(4) "*"
50 PRINT TAB(5) "*"
60 END
```

7. Have students make posters for classroom display indicating the effects of the different print punctuations.

TOPIC 64
Editing a Program - Line Editing (Radioshack, Apple MBASIC, Etc.)

Aim: How Can We Use a Line Editor to Make Changes Within a Program to Correct Errors?

Performance Objectives: Students will be able to:

- . explain what an editor is
- . differentiate between a line editor and a full screen editor
- . use a line editor to make changes within a program line without retyping the entire line

Vocabulary: New: editor, full screen editor, line editor, insert, delete
Review: direct mode, programming mode

Motivation:

- You have written the following program:

```
10 PRINT "What is your name?"
20 INPUT X$
30 PRINT "HELLO" X$
40 GOTO 25
```

If you type RUN, what will happen? (the computer will indicate ULERROR in 40 because line 40 sends you to line 25, which is an UnListed line.

How may we correct this mistake? Must we retype the entire program? (We may retype just line 40)

- Is there a faster way to correct this mistake, other than by retyping the whole line?

Development:

1. Let us look at line 40. It says:

```
40 GOTO 25
```

If we wanted this program to print the message HELLO (name) infinitely, what should line 40 have said?
(40 GO TO 30)
What must be corrected within the program? (25 must become 30)

2. We know that we may correct this program by retyping line 40 but is it necessary to retype the whole line because of a small error?

   Introduce the term "computer editor" as a routine which permits the programmer to make changes within the program without retyping the entire line or the entire word.

   There are two types of routines to correct errors which are available for today's computers:

   a) Screen editor - corrections can be made to anything that is on the screen, whether it is in the direct mode (PRINT"MARY") or the programming mode (10 PRINT"MARY").
      To correct errors the cursor is moved to the location of the desired change and the change is then made.

   NOTE: Not all computers have this feature. Some computers which do have this feature are the APPLE, COMMODORE 64 and PET.

   b) Line editor - corrections can only be made to program lines which have already been entered.
      Using a line editor generally requires the user to to type in the word EDIT followed by the number of the line to be edited.

      What would I type in in order to correct our error?
      (EDIT40)

   NOTE: Some examples of computers which have line editors are the TRS-80, IBM-PC, APPLE II with MBASIC

3. Review the fact that corrections to a line of programming may be made as the line is being typed by moving the cursor back to the error and then making the change, before entering the programming line into the computer's memory.

   Suppose I had typed in the following:

   ```
   40 PRINT "Teh rain is
   ```

   and realised that I made a spelling error typing in Teh instead of The. What could I have done, before entering the line within the computer's memory? (Backspace to the "e" in Teh)
   What happens when I backspace to the e? (Everything after the "e" is erased and must be retyped before entering)

4. Suppose I wanted to change the whole line of programming. How might I do that? (Retype the entire line. The computer will automatically replace the old line with the new one.)

   Suppose I wanted to erase the entire line. How might that be done? (Type in the line number and press ENTER. The computer replaces the old line with nothing, the new line, thus, in effect, erasing it.)

5. Line editing of program lines:
   Review the concept that line editing allows one to make changes in program lines without having to retype the whole line. Line editing is used for programming lines that have been stored within the computer's RAM.

   There are two different ways to place the computer in the EDIT mode (MBASIC)

   a) type EDIT followed by the line number, e.g., EDIT 55
   b) a syntax error will automatically place the computer in the edit mode

   RUN the following program and determine what happens:

```
10 CLS
20 PRINT "What is your name?"
30 IMPUT X$
40 PRINT "Welcome to computerland" X$
50 END
```

   When this program is run, what occurs?

```
( ?SN ERROR IN 30
  READY
  30  )
```

   The 30 in the last line indicates that the computer is in the edit mode ready to edit line 30 where the SyNtax error occurred.

6. Once the computer is in the edit mode, pressing certain keys will cause the computer to do certain things. There are eight such keys that have specific functions within the edit mode.

   With practice, editing will become easier to do within the edit mode, rather than retyping the entire line to correct an error.

The function keys are as follows:

MBASIC EDIT KEYS

PRESS	EFFECT
L	Lists the line you are editing and keeps you in the edit mode.
C	Enables you to CHANGE a character
D	Enables you to DELETE a character
I	Enables you to INSERT things into a line
X	Lists the entire line and enables you to add to the end of the line. (Using this key makes it as if the person was typing the line for the first time. When the cursor is moved to the left, all characters are erased in its path.
Q	CANCELs all changes and gets the computer OUT of the edit mode.
A	CANCELs all changes and KEEPs the computer in the edit mode
H	CHOPs or HACKs off the line from the cursor's position to the end of the line
SHIFT	To get OUT of I, H, X modes of edit
ENTER	Finalizes all changes and gets the computer OUT of the edit mode.

7. Distribute the following worksheet and have the students work on their own, practicing the functions within the edit mode. Stress to the students that this may be difficult at first but with practice, will become very easy for them to do - much easier than retyping entire lines of a program.

WORKSHEET in LINE EDITING in MBASIC

The following program will serve as our model for learning what the MBASIC edit mode is like. It will introduce you to the effects of the special keys. Only PRACTICE will make you proficient in their use.

```
10 PRUNT "THUS AT THEE ED ITT"
20 PRIMPT "MOODE OF THHE TRS-80"
30 ITISERY HPFLL
40 FORWECAN YUSE OT ANGE INKS WITTH OUT RETIPP
   INGTHELANEFOREVERMORE.
```

Using the edit mode we shall change the program to read:

```
10 PRINT "THISISTHEEDIT"
20 PRINT"MODEOFTHETRS-80"
30 PRINT"ITISVERYHELPFUL"
40 PRINT "FORWECANUSEITTOCHANGETHINGS
   WITHOUTRETYPINGTHEWHOLELINE"
```

Please note- Line numbers cannot be changed by using the edit mode. In order to change a line number, the line must be retyped with the new number.

1. Type in the practice program, exactly as it is written and then clear the screen.
   Now, let us edit line 10.

   a) Type:
   ```
   EDIT10 (ENTER)
   ```
   - we see:
   ```
   10
   ```

   b) Press the space bar a few times. You will notice that each time the space bar is pressed another letter of the line appears.

   c) Use the left arrow to move the cursor back to the beginning of the line.

   d) Press any letters EXCEPT the special ones we discussed (L,C,D,I,X,Q,A,H), as well as S or K.
   Backspace, erasing about half the line, then, press ENTER
   Notice that the whole line is listed and that we are out of the edit mode. How can you tell that this is so?

   e) Return to the edit mode to edit line 10. How do we do this? (type EDIT10 and press ENTER)

   f) Now, type L to list line 10 and KEEP the computer in edit mode. We see
   ```
   EDIT10
   10 PRUNT "THUSATTHEEEDITT"
   10
   ```

   g) To change the "U" in "PRUNT" to an "I", move the cursor over so that it is just below the "U":
   ```
   10 PRUNT "THUSATTHEEEDITT"
   10 PR
   ```

   Press "C" for CHANGE once and notice that nothing happens.
   Now, press "I". What happens? (an I has replaced the U)
   To prove that the change occurred, press "L"
   You will find that the rest of the line has been placed on the screen followed by the line number below it. This indicates that you are still in the edit mode at line 10.

   h) Change "THUS" to "THIS" doing it the same way you did "PRUNT" to "PRINT".
   Prove that the change was made.

   i) Change "AT" to "IS"
   Prove that the change was made by pressing "L" which lists the line with the changes made and keeps you in the edit mode.

Then, press ENTER to finalize
the changes within the computer's RAM

OR

Press ENTER which finalizes the changes and gets you out of the edit mode.

j) Now, let us DELETE the following:
an "E" in "THEE"
the space in "ED ITT"
The "T" in "ED ITT"

How may this be done? What key might we press to do this task within the edit mode?

k) Return to the edit mode in order to edit the rest of line 10.

l) List the line while in the edit mode.

m) Using the space bar, move the cursor to where the "E" that is to be deleted is. We see the following:

```
EDIT10
10 PRINT"THISISTHEEEDITT" (printed when L was pressed)
10 PRINT"THISISTHE
```

n) Press the "D" key. We see the following:

```
10 PRINT"THISISTHE!E!
```

The computer puts !! around the "E" to tell us that it has deleted what is inside them.

NOTE: On some versions of MBASIC slash marks "/ /" are used instead of exclamation points.

Now, before we go on, how might we see the changes that have just taken place?
What is the difference between the two methods of viewing these changes?

o) Press "L" twice, noticing what happens each time.

p) CAUTION: After using the DELETE function, DO NOT backspace. We will soon see why.

q) Now, remove the space in "ED ITT".
Space over so that the cursor is right after the "D" as follows:

```
10 PRINT "THISISTHEED
```

Press the "D" key. You will see the following:

```
10 PRINT "THIS ISTHE ED!!
```

What does the !! tell you?

r) Remove the extra "T" from "EDITT". You can remove either one, but try removing the first one.
Space over so that the cursor is under the space occupied by the "T" you wish to remove. The following will appear:

```
10 PRINT "THISISTHEEDI
```

Press "D".
Press "L". What happens?
Notice that this time the line is listed without the ! !
Are we still in the edit mode? How can you tell?

What must we do to effect the change within the RAM of the computer?

Do it.

s) Now, let's look at the problems created by backspacing after having used the "D" key.
Tell the computer that you wish to edit line 10.
Once you are in the edit mode, move the cursor to the beginning of the word "THIS" and delete the first three letters "THI".
Now, backspace until all the "!!" are removed.
Press "L" twice. Notice that you have not succeeded in cancelling the deletions by backspacing. The letters are still missing.

t) Press "A". What happens? Notice that the 10 appears. What does that indicate?

u) List the line and note that pressing "A" cancelled ALL the changes made since you entered the edit mode, but left you in the edit mode.

v) Re-edit the line, making all the changes again. To finalize all the changes, what will you do?

2. So far, we have seen how to CHANGE a character by using the C function key and how to DELETE a character using the D function key.

   Using these ideas, edit line 20 so that it will be:

```
20 PRINT"MODEOFTHETRS-80"
```

   HINT Remember to type EDIT20

3. Now, we will edit line 30. Enter the edit mode and list the line as you did before. It will appear as follows:

```
30 ITIS ERY HPFLL
```

   We would like to change the line to appear as

```
30 PRINT"ITISVERYHELPFUL"
```

Where shall we start?

a) The first corrections that must be made require no CHANGEs or DELETions. What we must do is INSERT missing letters.

In order to do this, we must use the "I" function key in the edit mode.

b) Once we are in the edit mode and have listed the line, the following will appear:

```
30 IT ISERYHPFLL
30
```

c) The first step we must take is to insert the word "PRINT", a space and a quotation mark (") before the word "it".

To do this, leave the cursor immediately after the 30. Press the "I" to enter the INSERT phase of the edit mode. Once we have pressed the "I", anything we type will be inserted in the space between 30 and IT. Spaces are also inserted at this time.

d) Insert the characters "PRINT " ".

e) Now, we wish change "ERY" to "VERY". We will first move the cursor to the space between "IS" and "ERY". What happens when you try to move the cursor?

f) We cannot move the cursor unless we get out of the INSERT mode since each time we press the space bar, we will be adding a space to the line.

g) To EXIT the insert mode press the SHIFT key first, and keeping it pressed, press the up arrow key. Then, release both keys.

h) Now, space over to the proper place and insert a "V" before the "ERY" to make the word "VERY".

i) Once that is done, complete the line by correcting the word "HPFLL" and making it "HELPFULL".
HINT Don't forget to get out of the insert mode first!

j) Suppose we typed in "L" while in the INSERT mode. What would happen?

Since we are still in the INSERT mode, "L" would be inserted also.

What would happen if we typed "A" while in the INSERT mode?

k) Press the "Q" key. Notice that you have QUIT the edit mode. How can you tell ?

l) Now, list the line again. What will you find? Because we typed "Q", we were able to get out of the edit mode, but also, all changes made since we entered the edit mode were cancelled.

m) Now, go back and re-edit the line correctly this time.

4. Now, let us edit line 40. Line 40 should appear as follows:

```
40  PRINT "FORWECANUSEITTOCHANGETHINGS
    WITHOUTRETYPINGTHEWHOLELINE"
```

a) First, we will tell the computer to edit line 40 and list line 40 as it is presently stored in RAM. How is that done?

The screen should now appear as follows:

```
40 WECAN YUSEOTANGEINKSWITTHOUTRETIPPING
   THELANEFOREVERMORE
40
```

b) Press the space bar and keep it pressed until the cursor gets to the end of the line and will not go any further. Remember, pressing any letter other than one of the special letters will have no effect. Try it.

c) Press "X". What happens?

The entire line was listed, just as when "L" was pressed However, using "X" we can now make changes

- We can erase letters by using the left arrow
- We can add letters

d) Now, let us use this technique to erase the words "FOREVERMORE" and change the word "LANE" to "LINE". After you have made these changes do not press any other keys.

e) Now, we will list the line. Type "L". What happens? You will find that the letter "L" was added to the line, instead of a LISTING of the line as we had wanted.

This is similiar to what happened when we were in the INSERT mode and wanted to LIST the line. How did we get out of the INSERT mode?------------------------
Do it.

f) Now, press "L" to list the line.

g) "X" is very useful for making changes at the end of the line or for adding new things on to the end of a previous line.

5. There is another way of removing "FOREVERMORE" from line 40. First, let's cancel our previous changes, but remain in the edit mode.
   How do we do that?__________________________
   Do it.

   a) We will remove "FOREVERMORE" from line 40 by HACKING or CHOPPING it off.

   b) When we pressed "A" to cancel our previous changes we were left with the following
      40

      Press the space bar, keeping it pressed down until the cursor is after the "E" of "LANE" and then, press "H". What happens?

   c) By pressing "H" at this point, all characters that appear to the right of the "E" are HACKed off. It also allows you to add anything you want to the end of the line.

      Once you have done this, press "L" to list the line.

   d) Now, press "Q" to cancel the changes and quit the edit mode.

   e) Re-edit line 40 changing it to the desired version.

Applications:

1. Try editing a line and changing its line number.
2. Can this be done?

Summary:

1. What is the purpose of an editor?
2. What is the difference between a line editor and a full screen editor?
3. Relate the functions that the following keys have in the MBASIC edit mode : C, D, I, L, H, Q, A

Exercises:

1. Would you use "X" to remove a word that was found at the beginning of a line? Why or why not?

2. Make a chart of the function keys used in MBASIC editing, explaining what each one does, and giving an example of each type of command.

3. Write a program with 5 different syntax errors. The program should be at least 6 lines long. Then, have your partner identify each error and correct it in the fastest possible way.

4. How do you get out of the INSERT mode? What other modes are exited in the same way?

TOPIC 65
Editing a Program - Fullscreen Editing - Commodore Version

Aim: How Can We Use a Screen Editor To Make Changes Within a Program?

NOTE: For APPLE computers, simply change the control keys to the acceptable ones.

Performance Objectives: Students will be able to:

- explain what an editor is
- differentiate between a line editor and a full screen editor
- use a line editor to make changes within a program line

Vocabulary: Review: editor, full screen editor, line editor,

Motivation: You have written the following program:

```
10 PRINT "What is your name?"
20 INPUT X$
30 PRINT "HELLO" X$
40 GOTO 25
```

If you type RUN, what will happen? (the computer will indicate ULERROR in 40 because line 40 sends you to line 25, which is an UnListed line.

How may we correct this mistake? Must we retype the entire program? (We may retype just line 40)

Is there a faster way to correct this mistake, other than by retyping the whole line?

Development:

1. Let us look at line 40. It says:

```
40 GOTO 25
```

If we wanted this program to print the message HELLO (name) infinitely, what should line 40 have said?
(40 GOTO 30)

What must be corrected within the program? (25 must become 30)

2. We know that we may correct this program by retyping line 40 but is it necessary to retype the whole line because of a small error?

Have the students explain what a computer editor is (a routine which permits the programmer to make changes within the program without retyping the entire line or the entire word).

Review the two types of routines to correct errors which are available for today's computers:

a) Screen editor- corrections can be made to anything that is on the screen, whether it is in the direct mode (PRINT"MARY") or the programming mode (10 PRINT"MARY").
To correct errors the cursor is moved to the location of the desired change and the change is then made.

b) Line editor - corrections can only be made to the program lines which have already been entered. Using a line editor generally requires the user to type in the word EDIT followed by the number of the line to be edited.

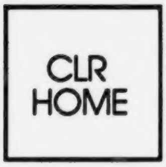
Which computers have full screen editors?
(the COMMODORE 64, PET , VIC 20 and APPLE)

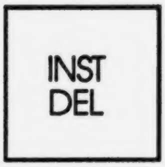
Which computers have line editors
(Some examples of computers which have line editors are the TRS-80, IBM-PC, APPLE II with MBASIC

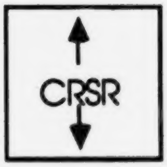
The basic operations of the full screen editors are the same, no matter which computer is being used. However, the specifics are different for each type of machine.

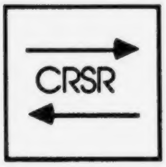
We will deal specifically, with the COMMODORE 64 editor.

3. The following keys are used in editing on the COMMODORE 64:









Elicit that pressing any of the keys will give the bottom function, while pressing the shift key and then while holding it down, pressing any of the other keys, will give the upper function.
Review each of the keys, eliciting the function of each.

4. The special function keys can be used in two different ways.
   - a- for immediate effect
     (press cursor and the cursor moves)
   - b- for later execution
     (as a cursor control code placed within a string whose action will happen ONLY when the program is run.)

   The computer advises the programmer that it is inserting the cursor action into the string by placing a code in the string.

COMMODORE EDITOR CODE

if you press	the computer prints
HOME CLR INST	S
DEL	DELETE is the only control key which works inside an open quote print statement.

5. When do changes take effect within the computer's RAM?
   (when RETURN is pressed)

The students will work on the following worksheet, at their own pace, following the instructions and answering the questions as they proceed.

NOTE: To indicate the use of the upper function, the (up arrow) will be used

* * *

WORKSHEET SCREEN EDITING
COMMODORE 64

1. During this lesson, we shall use _____ to indicate the upper function.

2. How is this done within the computer?__________________

   Remember- To activate the upper functions press SHIFT, keep it down and then press the function key.

3. How do you clear the screen?________________________

4. Now, type in the following words: 'LEAPINGLOUIE'.
   Do not press RETURN:

What happens when you press CRSR twice?
What happens when you then press CRSR four times?
What happens now when you press CRSR twice?
What happens when you press CRSR twice?
Finally, what happens when you press HOME?

5. We would now like to revise our words, DELETING "ING" from "LEAPING"
   How may we do that?

   Move the cursor to the "L" of "LOUIE".
   Press DEL. What happens?
   Notice that the space to the LEFT of the cursor was deleted.
   What is now on the screen? (LEAPINGLOUIE)

   Continue DELETING the "ING" of "LEAPING"

6. The screen should now appear as follows:
   LEAPLOUIE

   - Next, we would like to insert "IN" so that the screen will now be seen as follows:

   LEAPINLOUIE
   How might this be done?

   In the INSERT mode, spaces are inserted first, then, characters are placed within these spaces.

   Thus, to insert "IN " we must first INSERT the spaces.
   - place the cursor on the "L" of "LOUIE"
   - press INST three times. What do we now have?
     (LEAP   LOUIE)

   What happened to the cursor?__________________
   Notice that the cursor stayed where it was and spaces were inserted pushing the word "LOUIE" over.
   Now, type in "IN". Your screen should appear as follows:

   LEAPINLOUIE

   Where is the cursor now?
   The cursor should now be between the two words.

7. How can we now move the cursor past the two words?
   - Notice what appears to be a space between the words where the cursor is.
     Remember, three spaces were inserted for characters and yet, only two were used for "IN". Thus, the space between "LEAPIN"and "LOUIE" awaits a character or, as in this case, remains a space.

Thus, keeping this in mind, we will find that there are two different ways of moving the cursor past the two words.

a) Press the SPACE BAR to enter the space.
Now, press the ↑ (up arrow) to move the cursor past the word "LOUIE". The screen will now appear as follows:

   LEAPINLOUIE

b) The second way uses the CRSR to move the cursor over to the right of "LOUIE"

   Before we try this technique, let's return to our original problem. Clear the screen and type in "LEAPLOUIE".
   How do we edit this statement to read "LEAPIN LOUIE"?

   Follow the correct procedures so that the screen will read "LEAPIN LOUIE" and the cursor will be between the two words.

   (If you have trouble completing this task, read step 6 again.)

   Now, we are ready to continue.
   Use the CRSR to move the cursor over to the right of "LOUIE". Notice that you will see the following:
   LEAPINLOUIE

   The ↑ (up arrow) between the two words appeared because the computer placed it there. This is because you inserted three spaces for three characters and yet, only used two characters.

   When you pressed the ↑ (up arrow) key the computer assumed the third character you wanted to insert was the control character for ↑ (up arrow).
   It followed your directions and told you so by printing the ↑ (up arrow). Since that took up the third space you inserted, the cursor key action now returned to normal and it moved the cursor to the end of the word "LOUIE".

8. Now, let us examine the use of the edit with a PRINT statement.
Clear the screen and enter the following:

```
  PRINT 92 = 8 + 2
```

Do not press RETURN.

We would like to change the statement to:

```
PRINT 92 * 8 + 2
```

Notice, this is not a line of a program but rather a statement in the direct mode.

Now, to accomplish our task, use the CRSR keys to move the cursor to the "=" and replace the equal sign with a "*" to indicate multiplication. The statement should now appear as follows:

```
PRINT 92 * 8 + 2
```

Press RETURN to have the statement executed.

Next, let us type in the statement:

```
PRINT "92 = 8 + 2"
```

Do not press RETURN.
This statement contains an error. Correct the error so that the statement will appear as follows:

```
PRINT "92 * 8 + 2"
```

How will this error be corrected?
We may use the CRSR keys (do not use the DELETE key) to change the statement. Do it, then, press RETURN to execute the command.

Now let us look at a third example of editing PRINT statements, similiar to ones we have already discussed, yet, very different.

The following statement should be typed into the computer:

```
PRINT "92 = 8 + 2
```

Notice that the quotation marks were not closed and, RETURN was not pressed.

Try using the CRSR to change the "=" to "*".
You will find that pressing any of the "edit function" keys (e.g. CLR, HOME, INST, ↑ (up arrow)) gives the symbol that was demonstrated within the lecture.

This occurs because you are really typing inside a set of open quote marks and the computer assumes that you want the cursor movements to be a part of your string. The computer tells you that it has placed them there by printing the symbols that you see.

Press the DEL function key. What happens?
Suprisingly, it works!

At this point, you may do one of two things:

a. Delete up to the "=", change it to a "*" and retype the rest of the statement.

or

b. Close the quotation marks. The computer interprets this to mean that you have finished your string and that anything done to it from now on will be in the nature of editing. Thus, ALL "edit function" keys are then set to work normally.

8. We may also include the DEL key function within a string. Examine the following problem. Type the statement into the computer and do not press RETURN

```
PRINT "92 = 8"
```

Now, follow the following directions to include the DEL key function within the string:

a. Move the cursor to the "="
b. Insert a space
c. Press DEL. Notice that the computer printed a "T" to tell us that is will execute the DELETE function when it executed the PRINT statement. The screen should now appear as follows:

```
PRINT "92T = 8"
```

d. Press RETURN and note the result. You will find that the "2" was deleted by the embedded DELETE function and the screen now appears as:

```
PRINT "9 = 8"
```

9. Now, let us examine how we may edit lines of a program. Up until now, our editing has always concerned commands within the direct mode, not the programming mode.

There are only two rules to follow to edit program lines:

1 List the line to be edited
2 Move the cursor up to the line and edit it.

Now let us illustrate these steps.

Type in the following short program:

```
10 PRINT "2 + 3 ="
20 PRINT "6"
```

We would like to edit line 10 so that it reads:

```
10 PRINT "3 + 3 ="
```

How shall we do this? First, clear the screen.
What shall we do now?__________________________

When we type LIST 10 and press RETURN, the screen will say the following:

```
  10 PRINT "2 + 3 ="
```

Move the cursor to the "2" and make the change. Do not press RETURN.
Use the ↑ (up arrow) key to move the cursor down to the next blank line. Then, list the program. What happened? You will find that the change was NOT made. Remember, even though a change is made on the screen, the change is not made in the RAM memory until the RETURN key is pressed.
Now, go back and change the "2" to a "3" again, but this time, make sure the edited line is stored in RAM.

10. When we worked on line editing in the previous lesson, how were programming line numbers edited?
Was it possible to edit a specific line number, changing it to a different line number, while in the edit mode?

If you will recall, the only way to re-order or change line numbers was to retype the entire line again, this time using the new line number.

Such is not the case with full screen editing. This feature is invaluable and gives the user the ability to change line numbers and to duplicate lines at the same time.

Let's see how this works. Type NEW. Clear the screen and then type the following and press RETURN:

```
   10 PRINT 22
```

Move the cursor up to the "1" in "10" and press "2", changing the "10" to a "20". Press RETURN.

Repeat the process twice more, changing the "20" to "30" and then the "30" to "40". Once this is done, LIST the program. What happened?

You now have four duplicate lines of program as follows:

```
  10 PRINT 22
  20 PRINT 22
  30 PRINT 22
  40 PRINT 22
```

Should you wish to erase the original line, then just type the line number and press RETURN.

<u>Applications</u>:

Suggest some ways that line duplication while editing may be useful.

Exercises:

1. Compare and contrast a line editor and a full screen editor.
2. Make a chart of micro-computers presently available, and list the specific type of editing available with each. List any editing features which are unique to the particular computer.
3. John noticed that he had just typed in the following:

   ```
   PRINT "SHE SELLSSHESHELLS"
   ```

   and now wishes to change it to:

   ```
   PRINT "SALLYSELLSSEASHELLS"
   ```

   Using the full screen editor, correct John's work

TOPIC 66
Unconditional Branching - The GOTO Statement

Aim: How May We Repeat The Same Procedures Within a Program Without Repeatedly Writing The Same Instructions?

Performance Objectives: Students will be able to:

- identify the need to repeat a specific routine during the execution of a program
- define "looping" within a program
- use the GOTO statement to execute a "loop"

Vocabulary: New: loop, GOTO, infinite loop, unconditional branching BREAK, CONT
Review: PRINT

Motivation:

- Place five items around the room. List specific instructions on the board directing the students on how the five items are to be collected. The instructions should have the student making one continuous round and then at a specific time, loop back to a point to complete the task.

  Ask for one student volunteer. Have the rest of the class watch and help the volunteer and note the movement that takes place.

- Now, let's write a program which outputs your name as follows:

```
OUTPUT
JESSIE
JESSIE
```

How was that done?
(Sample program)

```
10 PRINT "JESSIE"
20 PRINT "JESSIE"
30 END
```

- Suppose we wanted to print a whole column with our name. Must we continue with

```
30 PRINT"JESSIE"
40 PRINT"JESSIE"
50 PRINT "JESSIE"
```

and so forth, or is there a faster way of doing this?

Development:

1. Let us look at the following program. Determine the output:

```
10 PRINT "*****"
20 PRINT "*******"
30 PRINT "***"
40 PRINT "***********"
50 END)
```

   Type the program into the computer, RUN the program and see if you were correct.

2. Suppose I wanted this graphics pattern to be repeated. What would I have to do? Would it be necessary to type in lines 10 to 40 again or is there a command I might be able to type in to tell the computer to repeat the pattern again?

   We may use a GOTO statement to accomplish this task. The GOTO statement is an "unconditional branch" which sends the program back to a specific line within the program and again continues the execution of the program from that line onward.
   It indicates that you GO from here TO there
   The specific line the program is being sent back to must be indicated after the GOTO command.

3. Now, returning to our problem, what lines of the program are to be repeated? (lines 10,20,30 40)
   What line must be executed before the computer returns again to line 10? (line 40)
   Where should we place our GOTO statement? (somewhere after line 40 but before line 50)
   Are there any specific conditions under which the computer will go to line 10, or, will the computer always go to line 10 once it reaches the GOTO statement? (it will always go to line 10)
   Show the students that this is an example of "unconditional branching" for it returns to a specific line regardless of any circumstances.
   Let us now add the GOTO statement to our program. Insert it within your program where you feel it belongs.

SAMPLE PROGRAM

```
10 PRINT "*****"
20 PRINT "*******"
30 PRINT "***"
40 PRINT "***********"
45 GOTO 10
50 END
```

4. RUN this program and record your results.
What happens?

Indicate to the class that their program should be continuously executed. The program will never stop.

Why is this so? (the program will never reach line 50 but instead, continuously returns to line 10 after executing line 45.)

This is an example of a program which has an "infinite loop", or a loop which never ends.

How can we stop this? What might we do to halt the execution of this program?
Have the class investigate. Have the students try some keys and see what happens.

By pressing the BREAK key, the program's execution is stopped. Have the class press the BREAK key to stop the program.

What happens when the BREAK key is pressed?
(Execution of the program can be halted and the computer will print the message BREAK in LINE ___)
What does this mean? (The computer halted execution of the program at line___)

5. Suppose at this point, we wish to have the computer continue execution of the program from where it left off. Is this possible, or, must the program be RUN again?

We may type in the command CONT to continue execution of the program from the BREAK in the program. Type in CONT and see what happens.

Once again, you will find that your screen is quickly filling up again. Will the program stop? (No)
What must we do to halt the program? (press the BREAK key)

Applications:

1. Modify the star program so that the screen will be erased before the pattern is printed out each time.

2. Modify the star program so that blank lines will be inserted between the lines of stars

Summary:

1. How do we tell the computer to repeat an action over and over again?

2. What is an infinite loop?

3. How may an infinite loop be halted during execution of program?

4. How may a program be resumed after it has been halted during execution?

Exercises:

1. Determine the output of the following programs:

```
    PROGRAM A
10 PRINT "My name is Roy"
20 GOTO 40
30 PRINT "What time is it?"
40 PRINT "What's yours?"

    PROGRAM B
10 X = 6
20 Y = 12
30 PRINT X * Y
40 GOTO 30

    PROGRAM C
10 PRINT "HELLO"
20 PRINT "GOODBYE"
30 GOTO20
40 GOTO 10
```

2. Write a program which will display your name all over the screen, not just in a column.

3. Type and run the following program:

```
10 PRINT "Funny Faces"
20 PRINT "Green Goggles "
30 PRINT "Friendly Frogs"
40 PRINT "Happy Hippos"
```

Now add the following line:

```
15 GOTO 40
```

Record the results

Rewrite line 15 as follows and record the results:

```
15 GOTO 30
```

Explain why there was a difference in output.

4. Type and run this program:

   ```
   10 PRINT "Running"
   20 GOTO 10
   30 END
   ```

   Now, BREAK and add the following: `15 PRINT "Forever"`

5. Type and run this program:

   ```
   10 PRINT "HITHERE";
   20 GOTO 20
   ```

   Record the results
   Now, change the semi-colon to a comma and record the results.

6. Examine the following program, forecast its output and then type and run the program:

   ```
   10 PRINT "I"
   20 GOTO 50
   30 PRINT "around"
   40 GOTO 80
   50 PRINT "can"
   60 GOTO 70
   70 PRINT "jump"
   80 GOTO 30
   ```

TOPIC 67
Input Statements

Aim: How Can the Answers to Questions Asked By the Computer During Execution of a Program Be Recorded and Stored Within the RAM Memory of the Computer?

Performance Objectives: Students will be able to:

- create an interactive program
- use an INPUT statement with numeric variables
- use an INPUT statement with string variables
- recognize the implications of a REDO message

Vocabulary: New: INPUT, interactive program, REDO, prompt
Review: alphanumeric variable, numeric variables, PRINT, use of semi-colon in PRINT, string variable

Motivation:

- If you were asked "What is your name?" what would be a logical response?
- Suppose the computer asked you what your name was. How could you answer the computer's question so that your response would be stored within the computer's memory?
- Let's look at the following program. When you RUN this program will you ever have an opportunity to respond to the questions the computer asks?

```
10 PRINT"What is your name?"
20 PRINT"What is your address?"
30 PRINT" What is your phone number?"
40 END
```

Development:

1. Returning to our program, what is needed within the program to allow the user to put responses to questions the computer asks into the computer?

   How can the programmer provide an opportunity for the user to answer questions the computer might pose?

2. We would like to "react" to the questions the computer asks. What is needed? (an opportunity to answer the questions) At what point within the program would your answer be inserted logically? (after the question is asked)

3. Let's re-examine the program

```
10 PRINT"What is your name?"
20 PRINT"What is your address?"
30 PRINT" What is your phone number?"
40 END
```

Insert an "X" wherever you feel it would be best to answer the questions that the computer asks

SAMPLE RESPONSE:

```
10 PRINT"What is your name?"
           X
20 PRINT"What is your address?"
           X
30 PRINT"What is your phone number?"
           X
40 END
```

4. What we would like to do is create an "interactive program in which the individual is permitted to "interact" with the computer in a "two-way" type of conversation. In this particular program we would like to have the message on line 10 appear, then we would like the user to be permitted to respond to that message immediately, answering the question the computer just presented.

We would like to be able to communicate with the computer while the program is running.

In an "interactive" program the user gives information to the computer and receives information from the computer while the program is being executed. The user and computer "interact" with each other.

An INTERACTIVE PROGRAM is a program which allows the user to "interact" with the computer by entering data as the program is run, rather than using pre-assigned values for the variables.

5. Now, we will try to create an "interactive" program which will permit the user to answer the questions the computer asks, as the program is RUN. The messages the computer asks of the user are known as "prompts".

Let us return to our original program.
The computer would like to know your name, address and phone number.
Once the computer has this information it will print out the message:

Hi (your name). You live at (your address). Your phone number is (your phone number).

6. Line 10 of the program states the following:

```
10 PRINT"What is your name?"
```

We would now like to insert the answer to this question.

What type of variable will your response be?(a string variable)

In order to accept the response, we must tell the computer to halt execution of the program and wait for information to be supplied by the user. Once that information is supplied, the computer may then proceed. The command that will do this is INPUT.

The INPUT statement allows us to assign a value to a variable as we use the program.
The INPUT statement places a question mark on the screen and prevents further execution of the program until the user has entered a response to the INPUT. Once the response is input, the program continues execution.

7. How does it appear on the screen as this program is executed?

```
10 PRINT "What is your last name"
20 INPUT L$
30 PRINT "What is your first name"
40 INPUT F$
50 PRINT " Welcome to computers"F$;L$
60 END
```

```
(SAMPLE OUTPUT)
What is your last name
? (last name)
What is your first name
? (first name )
Welcome to computers (first name last name) )
```

Why did a "?" appear as this program was executed? (Stress the fact that the "?" is used to indicate that the computer is waiting for a response to the INPUT statement and will remain on the screen until the response is given)

Write a program which will ask your name and then will print a message to you, including your name within the message.

```
SAMPLE PROGRAM
    ( 10 PRINT " What is your name?"
      20 INPUT N$
      30 PRINT "Hello there "N$ "I'm happy to meet
               you.")
```

9. How might the computer ask for your age?

```
            (10 PRINT"What is your age"
             20 INPUT A)
```

Why was line 20 INPUT A, not INPUT A$? (A is a numeric variable. Since the question asked requires a response of a number, a numeric variable may be used to name that number.)

Run the program above and type in your age in words. What occurs? (A REDO message appears on the screen)

Why does this message appear? What does this mean?

A REDO message indicates that the value you input for the variable is not the correct type, corresponding to the type of variable that was supposed to be INPUT.

In this case, you INPUT a string or alphanumeric variable, while the computer had been told that a numeric variable should be INPUT.

Application:

Write a program which will INPUT the ages of five members of the class and then, will output the average age of these five.

Summary:

What do we call a program which permits the user to interact with the computer while the program is being executed?

What useful programming tool aids the user in giving a correct response to an INPUT statement?

Exercises:

1. Write a program which will convert your weight from pounds to kilograms. (Kilograms = Pounds/2.2)
2. Write a program to convert your height from inches to centimeters. (Centimeters = Inches/.39)
3. Write a program to find the square root of any number which is INPUT.
   (HINT: the command SQR(X) will determine the square root of X)

4. Write a program which will ask for the length and width of a rectangle to be INPUT and then will output the perimeter and area of the rectangle. The output should contain the message:

   The perimeter of the rectangle is (answer).
   The area of the rectangle is (answer).

   HINT: Perimeter = 2 x (Length + Width)
   Area = Length x Width

TOPIC 68
Input Statements Part Two

Aim: How May the PRINT and INPUT Statements be Combined as a Single Programming Line?

Performance Objectives: Students will be able to:

- develop an interactive program
- use the enhanced INPUT statement as an alternative to the PRINT...INPUT statments
- input more than one variable at a time

Vocabulary: New: enhanced input
Review: interactive program, REDO, INPUT

Motivation:

- Determine the outcome of the following program when it is RUN

```
10 PRINT "What is your favorite number"
20 INPUT N
30 PRINT "What year were you born in"
40 INPUT Y
50 M = (N+Y)/(Y-N)
60 PRINT "Your mystery number is; M"
70 END
```

- Is this program an example of an "interactive" program? (yes)
- Why is this an "interactive" program? (It permits the user to interact with the computer as the program is being RUN.)
- Is there an alternative way to write this program, so as to shorten its length?
- How may it be done?

Development:

1. Return to lines 10 and 20. How might these two lines be combined into a single programming line?

   (10 PRINT"What is your favorite number": INPUT N)

   What programming technique allowed these two lines to be consolidated within a single programming line? (the colon is used to separate multiple commands within the same line.)

Review the use of the colon as a means of writing multiple commands within a single line.

Using the same technique, consolidate lines 30 and 40 then retype the program into the computer using the consolidated form.

```
10 PRINT"What is your favorite number" :INPUT N
20 PRINT"What year were you born in": INPUT Y
30 M= (N + Y) / (Y - N)
40 PRINT "Your mystery number is " M
50 END
```

2. Has the program been shortened? (show that there are less line numbers now, but there are still as many commands as before.)

   How may we shorten this program more?

3. To further consolidate the program we may combine the PRINT and INPUT statements into a single programming line.

   Examine lines 10 and 20 above, then compare them to the following single line

   ```
   10 INPUT" What is your favorite number"; N
   ```

   What occured in this new line? (A single INPUT, followed by the message to be printed, then followed by the name of the variable to be input was used instead of the PRINT statement, followed by an INPUT statement)

   This is an example of an "enhanced INPUT" statement.

   An "enhanced INPUT" statement combines a PRINT and an INPUT statement into a single command. The INPUT statement is followed by the message to be printed enclosed within quotation marks, followed by the name of the variable assigned to represent the response the program user gives.

4. Rewrite the following program using the enhanced input statement, instead of the PRINT and INPUT statement

```
 10 PRINT "What is the student's last name"
 20 INPUT A$
 30 PRINT "What is the student's first name"
 40 INPUT B$
 50 PRINT "What is test grade#1 "
 60 INPUT X
 70 PRINT "What is test grade #2"
 80 INPUT Y
 90 PRINT "What is test grade #3"
100 INPUT Z
110 G =(X+Y+Z)/3
120 PRINT "STUDENT'S NAME","AVERAGE"
130 PRINT B$A$,G
140 END
```

```
(10 INPUT"What is the student's last name";A$
 20 INPUT "What is the student's first name"; B$
 30 INPUT "What is test grade #1";X
 40 INPUT "What is test grade #2";Y
 50 INPUT "What is test grade #3";Z
 60 G = (X+Y+Z)/3
 70 PRINT "STUDENT'S NAME", "AVERAGE"
 80 PRINT B$A$,G
 90 END
```

5. Is it possible to simplify this program further? How might you simplify lines 10 and 20? (Suggest that you might have written a single question in a form similiar to type in last name, then first name putting a comma between them.)

Show that a single INPUT statement may be used to insert more than one variable into a program in a single instance. Replace lines 10 and 20 with the following single line:

```
INPUT "Enter last name then first name, separated by a comma"; A$,B$
```

RUN the program and determine what occurs.

Review the fact that the ? is used to indicate the computer is awaiting a response from the user. In this case, the computer is waiting for the last name and first name to be INPUT, either one at a time, or both at the same time. If the last and first name are INPUT one at a time, the computer will indicate a "?" For the first number to be INPUT, and when entered, will indicate a "?" For any other variables to be input from that single line, in this case the first name, B$.

If the last name and first name are INPUT all at once, they are input using a comma to separate each variable.

Using this technique simplify lines 30 to 50 .
(30 INPUT"List the student's three grades";X,Y,Z)

Application:

Write a program to determine the average of any 5 numbers using the enhanced INPUT statement to input the five numbers all at the same time.

The prompts should ask for the five numbers, then the average should be calculated by the computer.

Summary:

What do we call a program which permits the user to interact with the computer while the program is being executed?

How might a PRINT and INPUT statement be combined into a single programming statement?

Compare an INPUT statement with an enhanced INPUT statement.
How are they similiar? How are they different?

Exercises:

1. Write a program that would determine the diameter of a circle, when the radius is known, using enhanced INPUT statements. The output should appear as follows:
   "The diameter of a circle with radius ___ is ___"

   NOTE: diameter = 2 x radius.

2. Write a program that will compute a baseball player's batting average, once the user INPUTS the number of times the player was at bat and the number of times he scored a hit. The output should include the player's name and batting average.
   (Batting average = hits scored / times at bat)

3. Mr. Smith would like to write a program which will calculate the average miles per gallon his car uses, knowing how many miles he drives and the total amount of gas he uses.

   Write a program to accomplish this task for Mr. Smith. Use enhanced INPUT statements to input the miles driven and total amount of gas used.

NOTE: Average mpg = Total miles/ total gallons

TOPIC 69
Flowcharts and Decisions

Aim: How May a Decision be Denoted Within Flowcharting Procedures?

Performance Objectives: Students will be able to:

- identify and use symbols of inequality
- identify and use flowchart symbols
- interpret and trace a flowchart involving decisions
- create flowcharts to solve problems involving conditions

Vocabulary: New: decision, assignments, inequality, greater than, less than
Review: Input, output, processing

Motivation:

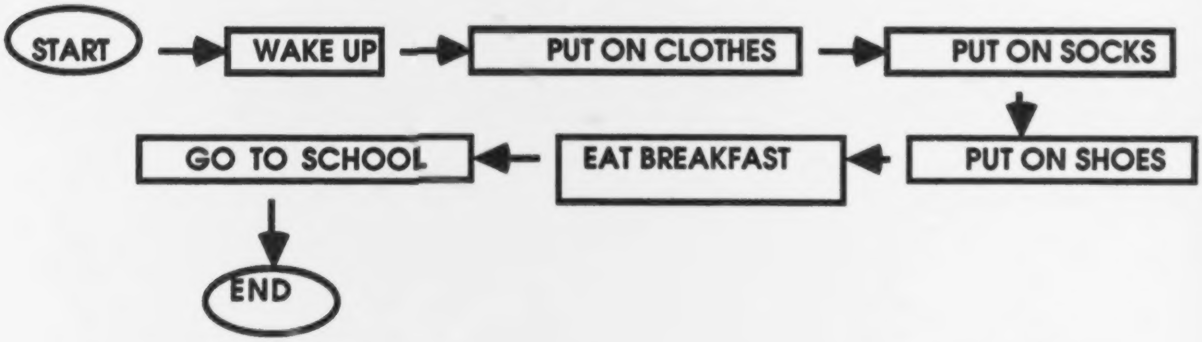
Arrange the following activities in the order they should be performed:

1. Eat breakfast
2. Put on shoes
3. Wake up
4. Go to school
5. Put on socks
6. Get out of bed

(sample solution:)
Wake up
Get out of bed
Put on socks
Put on shoes
Eat Breakfast
Go to school

Why do we follow this sequence?
How would we flowchart this sequence? Draw the flowchart that shows these steps.

Sample solution: (FLOWCHART #1)



Let's add another element to this sequence of events. What is something you should do after each meal? (Brush your teeth).

Where would this step have to be inserted within the flowchart? (after eating breakfast).

How may we write this statement as a question?
(Did you brush your teeth?)

What response would be appropriate to that question? (yes or no)

This response presents us with a "decision" that has to be made - did you brush your teeth or didn't you?

Development:

1. First, let us review the flowchart symbols that may be used to create a flowchart.

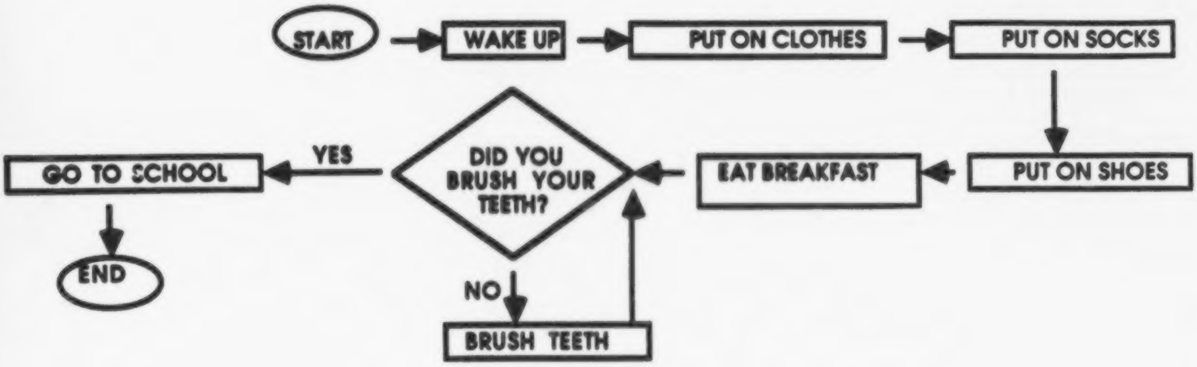
   What symbol is used to begin or end a flowchart? (oval)

   What shape is used to indicate the processing of information and instructions? (rectangle)

2. In flowcharting, when we ask a question that involves a decision, such as "Did you brush your teeth?", we use a diamond shaped figure.

   Let us look at our example again. We will add a diamond for the decision and two arrows. A "yes" response leads in one direction; a "no" response leads in a different direction.

FLOWCHART #2


START
WAKE UP
PUT ON CLOTHES
PUT ON SOCKS
PUT ON SHOES
EAT BREAKFAST
DID YOU BRUSH YOUR TEETH?
YES
GO TO SCHOOL
END
NO
BRUSH TEETH

3. Now, examine the following program.

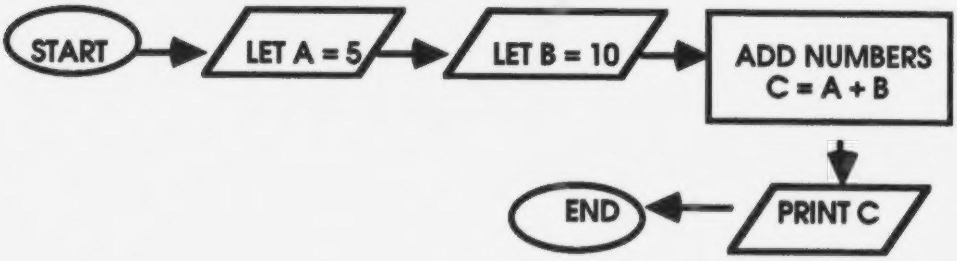
```
10 LET A = 5
20 LET B = 10
30 LET C = A +B
40 PRINT C
50 END
```

   What type of statement is used on lines 10 and 20? (assignment statements)

   What is an assignment statement? (an assignment statement is a statement used to indicate that information is coming in or is going out.)

4. How may an assignment statement be denoted within a flowchart? When we put information into the program or get output, we use a parallelogram shape in the flowchart. Now let us return to our program and draw the flowchart.

FLOWCHART #3

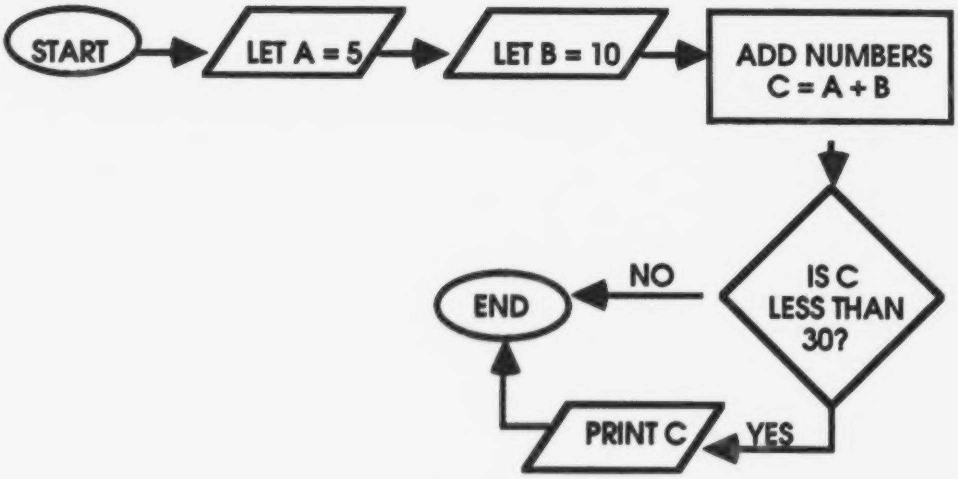

START
LET A = 5
LET B = 10
ADD NUMBERS
C = A + B
PRINT C
END

5. We will now revise our flowchart. Suppose we want to PRINT C only when the total is less than 30. How may we do this?

What type of statement is needed? (a decision statement)
How is a decision statement indicated within a flowchart?
(by use of an diamond shape)

Revise the flowchart so that if C is less than 30 it will be printed. If it is greater than or equal to 30 then the program will END.

(FLOWCHART #4)


START
LET A = 5
LET B = 10
ADD NUMBERS
C = A + B
IS C
LESS THAN
30?
NO
END
YES
PRINT C

6. Let's look closer at the decision statement we just wrote.

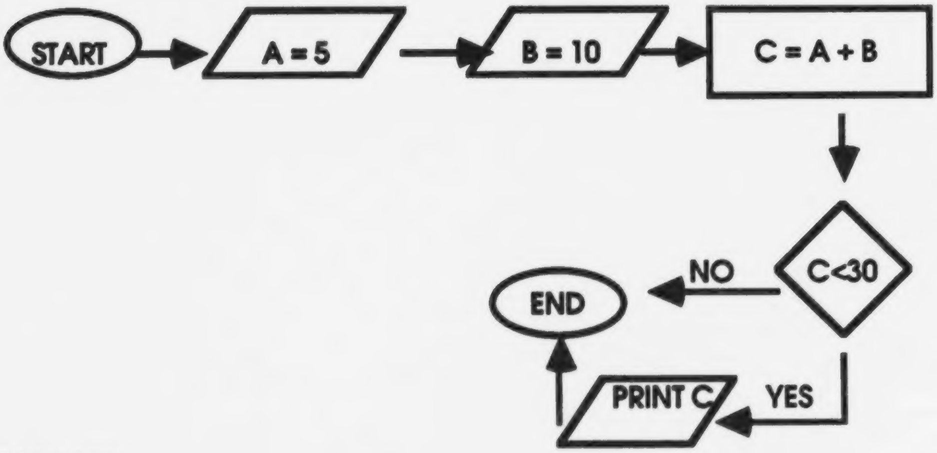
Is there a shorter way of expressing the decision statement?
Are there any mathematical symbols which may be used to express this statement?

Instead of writing: "Is C less than 30" how might we have expressed this term mathematically? (C < 30)

Review the relational operators

Verbal meaning	Arithmetic symbol	BASIC symbol
less than	<	<
greater than	>	>
equal to	=	=
less than or equal to	≤	<=
greater than or equal to	≥	>=

Now, how would the decision be expressed in flowchart form? (FLOWCHART #5)



Application:

Create a flowchart which will INPUT two numbers A and B and then will PRINT the smaller of the two different numbers as output.

Exercises:

1. Sam is a visitor from outer space. He wants to know all about life on Earth. He has asked you to help him find out how to do the things you do. Then he wants to write down the directions to take home with him.

   Write a set of directions to help him

   a) tie a shoelace
   b) make a bed
   c) make a cup of tea

   Write a flowchart for your directions.

2. Write the following statements using BASIC symbols:

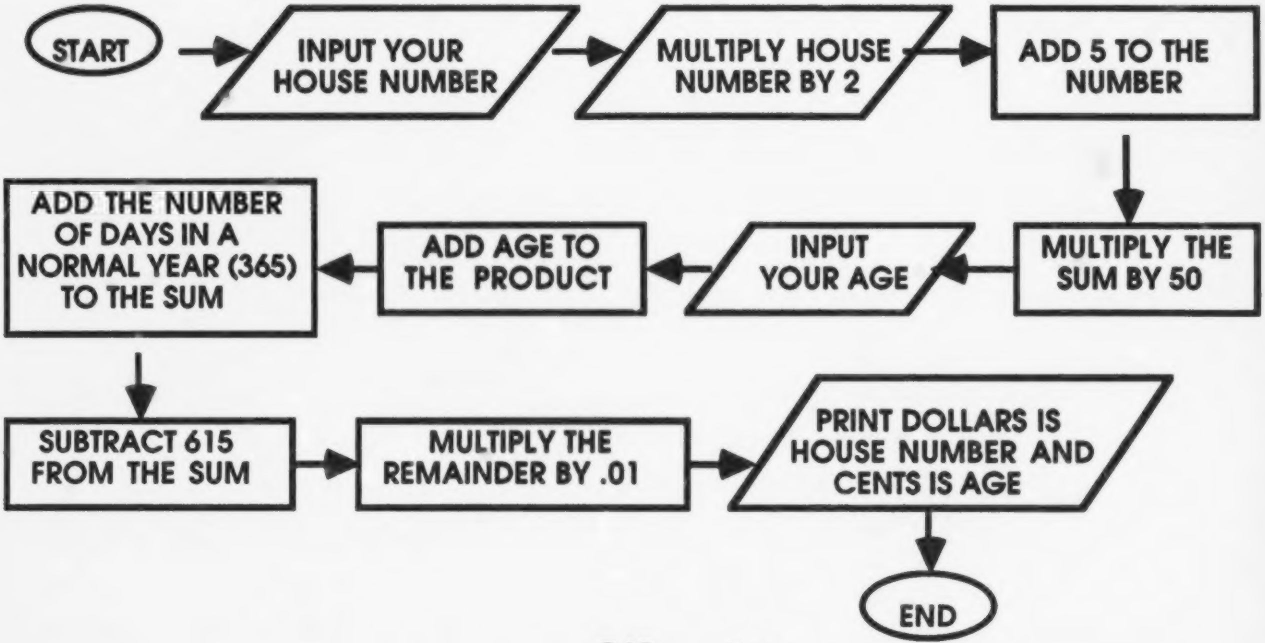
   a) 100 equals 10 times 10
   b) 50 is less than 100
   c) 50 is greater than 25
   d) 24 is less than or equal to 5 times 4
   e) 72 is not equal to 12 plus 80

3. Students want to know if they are reading above or below grade level. Draw a flowchart which will help them decide if they are reading below grade level, on grade level, or above grade level. Grade level is equivalent to your present grade. Thus, a fourth grader's grade level would be fourth grade.

4. The following procedure will determine a person's house number and age. Draw the flowchart corresponding to the directions:

   1 Double your house number
   2 Add 5
   3 Multiply by 50
   4 Add your age
   5 Add the number of days
     in a normal year (not a leap year)
   6 Subtract 615
   7 Put in a decimal point
     to show dollars and cents
   8 The dollar is your house
     number and the cents is your age

(FLOWCHART #6)


START
INPUT YOUR HOUSE NUMBER
MULTIPLY HOUSE NUMBER BY 2
ADD 5 TO THE NUMBER
MULTIPLY THE SUM BY 50
INPUT YOUR AGE
ADD AGE TO THE PRODUCT
ADD THE NUMBER OF DAYS IN A NORMAL YEAR (365) TO THE SUM
SUBTRACT 615 FROM THE SUM
MULTIPLY THE REMAINDER BY .01
PRINT DOLLARS IS HOUSE NUMBER AND CENTS IS AGE
END

TOPIC 70
The IF/THEN Statement

Aim: How Do We Write a Program To Incorporate Conditional Branching?

Performance Objectives: Students will be able to:

- define the IF/THEN statement
- identify the need to use an IF/THEN statement within some decision statements
- analyze the IF/THEN statement
- execute an IF/THEN statement to discover the results
- write a program using the IF/THEN statement involving numeric variables

Vocabulary: New: IF/THEN, loop, conditional branching
Review: decision statement, GOTO

Motivation:

Have two students stand outside the closed classroom door and knock on the door. While they are still outside the door, pose this problem to them and to the rest of the class:

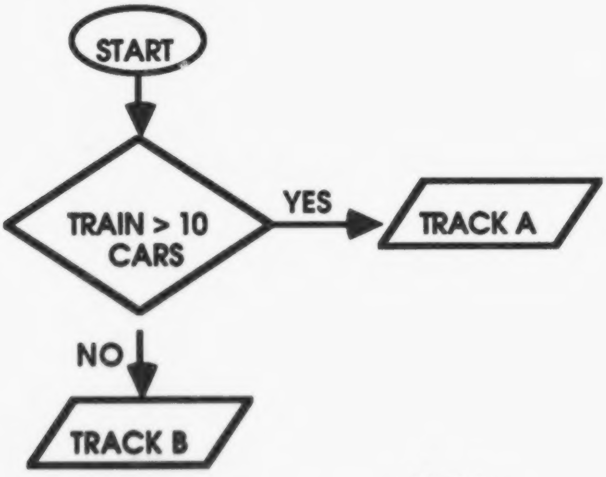
> What would you do if no one answered the knock at the door?
> What would you do if you heard a cry of HELP from inside the classroom?
> What would you do if the teacher opened the door?

Review all of the different possibilities from above and have the students act out the possibilities.

Now, pretend you are a train engineer. The train approaches a branch in the tracks. We know that if the train has more than 10 cars it goes to Track A, otherwise it goes to Track B.

Write a flowchart to show how you, the engineer, make the decision.

(FLOWCHART #1)



Development:

1. In order to determine which track we go to, what do we need to know? (The number of cars the train contains)

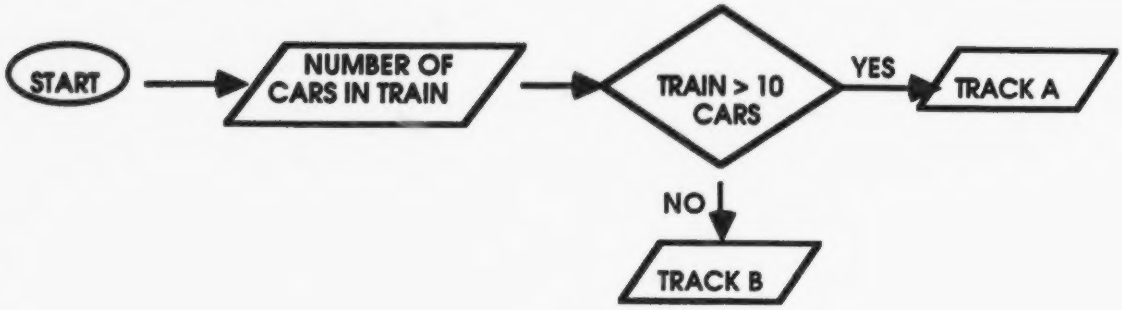
   A "condition" must be met in order for the train to take Track A or to take Track B.

   Suppose the train has 7 cars. What track would it go to? (Track B)

   Under what conditions would the train go to Track A?
   (When it has 10 or more cars)

   How might we expand the flowchart to show the entire process? Complete the flowchart.

(FLOWCHART #2)



2. Now, let us develop the program which corresponds to this flowchart.

   How might we write the programming line corresponding to the decision statement?

   An IF/THEN statement is a conditional statement which allows the computer to tell if a statement is true or false. If the statement is true, then the program will go to the statement directly after THEN. If the statement is not true then the program will go on to the next line of the program code. It is generally written in the form:

   IF (condition)THEN GOTO (line number).

3. What is the output of the following program?

```
10 INPUT "HOWOLDAREYOU?"; A
20 IF A = 18 THEN PRINT "YOU CAN VOTE"
30 IF A > 18 THEN PRINT"OF COURSE YOU CAN VOTE"
40 IF A < 18 THEN PRINT "SORRY, YOU ARE NOT OLD ENOUGH"
50 END
```

How might we alter the program so that we could "trap" silly answers, such as 500 years old?

```
SAMPLE PROGRAM
  10 INPUT "HOWOLDAREYOU?"; A
  20 IF A> 100 PRINT " YOU ARE PULLING MY LEG"
  30 IF A = 18 THEN PRINT "YOU CAN VOTE"
  40 IF A > 18 THEN PRINT"OF COURSE YOU CAN VOTE"
  50 IF A < 18 THEN PRINT "SORRY, YOU ARE NOT OLD ENOUGH"
  60 END
```

4. Many uses of the IF/THEN statement occur in computer quizzes. What would the output of this program be?

```
10 INPUT "HOW MANY OUNCES IN A POUND?";L
20 IF L=16 THEN GOTO 40
30 IF L <>16 THEN PRINT "SORRY, TRY AGAIN"
35 GOTO 10
40 PRINT "CORRECT"
50 END
```

5. How are a GOTO statement and an IF/THEN statement similar? (BOTH can be used to cause "branching" that will transfer the program flow in a particular direction.)

Summary:

1. What programming statement is used for conditional branching within a program?

2. How does the computer know what to do within an IF/THEN statement?

3. How are conditional branching and unconditional branching different?

Exercises:

1. Write a program that will count from 20 to 60, using an IF/THEN statement.

2. Design a flowchart which will allow a person's age to be INPUT, then will determine if the person is a child, teenager, or adult (child- less than 13, teenager- 13 to 19 inclusive, adult- greater than 19.)

3. Develop the program corresponding to the flowchart for problem #2

4. Which of the following are valid programming statements:

```
10 IF X>=10 THEN GOTO 60
20 IF 10 < Z THEN GOTO 100
30 IF X = Y THEN PRINT "HELLO"
40 IF X = Y = 6 THEN GOTO 20
50 IF X IS MORE THAN 10 GOTO 70
```

TOPIC 71
The IF/THEN Statement Part Two

Aim: How Might We Use a Conditional Branch Within a Program That Will Require a Word Response Rather Than a Numerical Response?

Performance Objectives: Students will be able to:

- use an IF/THEN statement to determine a response path
- create a program using IF/THEN statements involving string variables as well as numeric variables
- create a program using IF/THEN...ELSE statements

Vocabulary: New: IF/THEN...ELSE,
Review: string variable, conditional branching, IF/THEN, infinite loop, GOTO

Motivation:

Forecast the output of the following program:

```
10 INPUT "What is your name?";A$
20 INPUT "How old are you?";B
30 PRINT "Hello";A$
40 PRINT "Do you want me to print your name again?"
50 PRINT "Answer yes or no"
60 INPUT C$
70 GOTO 40
80 END
```

Why will this program never stop? Why does it continue to print the question "Do you want me to print your name again? Answer yes or no"? (because of line 70 which sends the program back to line 40, creating an "infinite loop".)

If your response had been NO when the computer asked "Do you want me to print your name again?", would the computer have followed your directions? (no) Why not? (regardless of the response, the computer automatically goes back to line 40.)

What might we have done so that the computer would follow your order not to print your name again? (we could have written a decision statement into the program so that when the "no" response was given by the user the computer would not print the name again.)

Development:

1. Let us return to the program:

```
10 INPUT "What is your name?"; A$
20 INPUT "How old are you?";B
30 PRINT "Hello";A$
40 PRINT "Do you want me to print your name again?"
50 PRINT "Answer yes or no"
60 INPUT C$
70 GOTO 40
80 END
```

What might we do to modify this program so that the computer will follow our wishes and print the name again when the response is "yes" and will not print the name when the response is "no"?

We may create a decision statement within the program. What programming command might we use? (an IF/THEN statement)

How may we word this decision statement so that the computer will return to line 30 when the person answers "yes"? (IF C$ = "yes" THEN GOTO 30)

On which line might this statement be placed? (line 70)

2. Now, let us rewrite this program, inserting that line. The program will appear as follows:

```
10 INPUT "What is your name?";A$
20 INPUT"How old are you?";B
30 PRINT "Hello ";A$
40 PRINT "Do you want me to print your name again?"
50 PRINT "Answer yes or no"
60 INPUT C$
70 IF C$ = "yes" THEN GOTO 30
80 END
```

Why are quotation marks placed around the word "yes"? Review the fact that the $ symbol indicates to the computer that the variable is a string varaible. The quotation marks are used to indicate to the computer that the value of the variable is between those quotation marks.

3. Determine the output of the following program:

```
10 INPUT "Do you like this class?";A$
20 IF A$ = "yes" THEN PRINT "GREAT! I love you!"
30 IF A$ = "no" THEN PRINT "Sorry about that."
40 END
```

4. Complete the following program:

```
        10 INPUT "Are you a boy or a girl?"; X$
        20 IF X$ = "BOY" THEN PRINT "Hello there boy."
        30 IF .......................................
        40 END
       (30 IF X$ = "GIRL" THEN PRINT "Hello there girl.")
```

5. Type in the following program:

```
        10 INPUT "What is your favorite color?"; C$
        20 IF C$ = "blue" THEN PRINT "Just like the sky"
        30 IF C$ = "red" THEN PRINT "Just like a rose"
        40 END
```

Suppose your response to the INPUT statement is "green" What occurs? (The program will not print a response, but will END without printing any message.) Revise the program so that a message will appear when green is chosen.

```
     (Sample response
          10 INPUT "What is your favorite color?"; C$
          20 IF C$ = "blue" THEN PRINT "Just like the sky"
          30 IF C$ = "red" THEN PRINT "Just like a rose"
          40 IF C$ = "green" THEN PRINT "Just like a lime"
          50 END)
```

Now let us revise the program further. We would now like to end the program when the word "purple" is typed in. Where might this line be added? (anywhere after line 10 and before line 50)

What might this line say?

(IF C$ = "purple" THEN GOTO 50)
Revise this program and RUN it. Use "purple" as your favorite color and determine what happens.
(The computer will give no response, but will end the program.)

6. What is the purpose of this technique?

This is an example of a "flag". A "flag"is used to key the computer to a specific response and when that response is given, to cause a specific reaction.

Examine the following program:

```
        10 INPUT "What is your name?"; N$
        20 IF N$ = "GOODBYE" THEN GOTO 70
        30 INPUT "What is your address?";A$
        40 PRINT "HELLO";N$;"MY NAME IS COMPU ED
           AND I LIVE AT TWO COMP LANE"
        50 PRINT "YOU LIVE AT ";A$
        60 GOTO 10
        70 END
```

When this program is run, what happens when the word "GOODBYE" is typed in? (The program's execution is ENDed.)

Is "GOODBYE" a "flag"? (yes)

Summary:

What is the purpose of quotation marks used with string variables?

How may string variables be used within decision statements?

What is a "flag"

Exercises:

1. Write a program which will ask for your name, how many times you wish it to be printed out and then will print it out that number of times.

2. Create a program which will find the average of a group of numbers. Have the computer ask how many numbers are to be added. The computer will then compute and print out the average. The computer will then ask if you would like to compute the average of another group of numbers.

3. Write a program which will ask three multiple choice questions and will print the word "correct" if the answer is correct and "wrong" if the answer is incorrect.

4. Create a program which will ask a person's age and then will print the message, "You are too young to vote in the national election", if the age is less than 18 and will print "You are able to vote in the national election" if the person is 18 or older.

TOPIC 72
Printing Numbers

Aim: How Might we Create a Program to PRINT All Whole Numbers from a Given Number, in Specific Increments, up to a Certain Number, or Forever?

Performance Objectives: Students will be able to:

- initialize a variable
- increment a variable
- reassign to a variable a new value other than the one it previously had

Vocabulary: New: variable initialization, increment,
Review: assignment statement, LET, numeric variable

Motivation:

- Set A is the set of all whole numbers that exist. What are the values of the numbers in set A (set A = 1,2,3...)

- Is there a largest whole number? (no)
- Is there a smallest whole number? (yes, 0)

- Is 19 a whole number? (yes) If we wanted to determine what the next whole number after 19 is, how would we find it? (add 1 to 19 to get 20)

Development:

1. Examine the following program. What is the output?

```
PROGRAM A
10 PRINT 1;
20 PRINT 2;
30 PRINT 3;
40 PRINT 4;
50 PRINT 5
60 END
     (output: 1 2 3 4 5)
```

- Would it be possible to use the same technique to print ALL the whole numbers? (no) Why not? (the set of whole numbers is an infinite set and you would never finish writing all the PRINT statements if you wanted to PRINT all the whole numbers?)

2. What might we do instead? How might we write a program which will list all the whole numbers?

   - What is the first number to be printed? (0)
   - What are the second and third numbers to be printed? (1,2)
   - By how much does each of these numbers vary? (1)

3. Would it be possible to assign an initial value of zero to a variable and then use that variable to obtain more whole numbers to be printed?

   . What is an assignment? (an assignment is a mapping which is used within a computer to keep track of the location of a particular piece of information.

   . How is an assignment indicated within a computer program? (by use of the LET statement)

   . How may we assign the value of 0 within the program? (LET X = 0)

   . What do we call the X? (a variable)

   . What is a variable? (a variable is a symbol used to represent a number or expression.)

   . Review the fact that the variable name is always written first, followed by an equal sign and finally by the value which is to be assigned to that variable.

   . What type of variable is X? (a numeric variable)

   . Review the fact that a numeric variable names a memory location for a number or an arithmetic expression. It "initializes" a value for a specific variable.

4. If we initially say that X = 0, what we have just done is "initialize a variable".

   . When a variable is initialized, a specific value is given to the variable when that variable is first set up within the program.

   Let us examine the following program. Determine the output:

```
         PROGRAM B
         10 A = 12
         15 B = 6
         20 X = A + B + C
         30 PRINT A; B; C
         40 PRINT X
         45 END
      (output: 12  6  0
               18)
```

   . What variables were initialized? A, B, X

   . What happened to C? What did the computer give as a value of C? We can see that C was not initialized. No initial value of C was stated within the program. What did the computer do? The computer then assumed that the value of C was 0.

   . When a variable is not initialized, the computer assigns a value of 0 to the variable.

5. Now, let us return to the program we wish to create. We will initialize our first whole number, X, at 0. Since we wish to PRINT all whole numbers from 0 onward how might we proceed with the assignment of the next whole number?
   What programming statement will increase X by 1 and yet will name this new variable X? (X = X + 1)

   - What happened to X when the line X = X + 1 is added? (the value of X has now been reassigned. It is now 1 more than it previously was.)
   - What happened to the original value of X = 0? (the value of X which was originally 0 now was reassigned to have a value of 1)

   - Suppose we had wanted to increase the value by 2 more than 0, how would the statement be written? (X = X + 2)

   - Now, let us list the program we have so far.

```
PROGRAM C
10 X = 0
20 X = X + 1
```

6. What is the output? (there is no output)
   Why is there no output? (there are no instructions within the program for the computer to output any variables or messages.)

   - Rewrite the program so the values of X will be output

```
sample program:
10 X = 0
15 PRINT X
20 X = X + 1
30 PRINT X
40 END
```

   - What is the output?

```
0
1
```

   - We now have the first two whole numbers PRINTed. How might we program the computer so that the next whole number will be PRINTed? (Change the X to one more than the previous X)
     Must we now add a line increasing the value of X by saying X = X + 1, or may we do something else?

   Let us examine the program with this next line:

```
10 X = 0
15 PRINT X
20 X = X + 1
30 PRINT X
40 X = X + 1
50 PRINT X
60 END
```

. Examine the program. Lines 20 and 40 look exactly alike. Was it necessary to use both lines 20 and 40 or could we have used that programming statement just once within the program? What might we have done?

7. Could we have created a loop within this program so that the second and third whole number could be arrived at using the same instructions? Would we be able to use this loop so that all whole numbers could be printed? What statement might we have used to accomplish this loop? (We could have used a GOTO statement)

   Revise the program inserting a GOTO statement so that all whole numbers may now be PRINTed out.

```
               PROGRAM C

               10 X = 0
               15 PRINT X
               20 X = X + 1
               30 PRINT X
               35 GOTO 20
               40 END

          (output:  1
                    2
                    3
                    4
                    5  ...     )
```

<u>Applications</u>:

1. If A has an initial value of 5, what is A when it is renamed as A = A * 3?

2. What is an increment?

<u>Summary</u>:

1. How are values of variables initialized?

2. When is the initial value of a variable equal to zero?

3. How can X = X - 4 be a true statement?

<u>Exercises</u>:

1. In the following programs, forecast the outcome:

```
PROGRAM 1
10 X = 3
20 PRINT X
30 X = X * 3
40 GOTO 20
50 END
```

PROGRAM 2

```
10 X = 0
20 PRINT X
30 X = X + 2
40 GOTO 10
50 END
```

PROGRAM 3

```
10 X = 5
20 PRINT X
30 PRINT
40 X = X-1
50 GOTO 20
60 END
```

PROGRAM 4

```
10 X = 1
20 PRINT X
30 IF X > 50 GOTO 60
40 X = X + 1
50 GOTO 20
60 END
```

2. Write a program which will PRINT all even numbers (those numbers from 0 in increments of 2 i.e. 0,2,4,6,...)
3. Write a program which will PRINT all the whole numbers greater than 20 and less than 40
4. Write a program which will PRINT all odd numbers less than 100. Skip a space between each item printed.
5. Write a program which will ask you to INPUT the first number to be PRINTed, the last number to be PRINTed, and the increments to be used, and then will PRINT all the numbers between the first and last number INPUT, in increments as stated.

TOPIC 73
FOR-NEXT as a Counting Function

Aim: How Do We Make a FOR-NEXT Loop Repeat a Certain Act a Specified Number of Times?

Performance Objective: Students will be able to:

- .define the function of the FOR-NEXT loop in a simple counting program
- .use the FOR-NEXT loop in a simple counting program
- .use the FOR-NEXT loop in a repeat PRINTing program
- .use the FOR-NEXT loop in a STEP increment program

Vocabulary: New: FOR-NEXT, STEP, controlled loop
Review: GOTO, IF-THEN, LET

Motivation:

Write a program that will print, "I do repeat myself" ten times. Use the PRINT statement only once.

Sample 1:

```
10 LET N=0
20 IF N=10 THEN END
30 PRINT "I do repeat myself."
40 LET N=N+1
50 GOTO 20
```

Sample 2:

```
10 N=1
20 N=N+1
30 PRINT "I do repeat myself."
40 IF N>10 THEN END
50 GOTO 20
```

- . How do we print something ten times? (We must go back to that statement ten times.)

- . What is the name of the function that allows us to repeat a procedure over and over again? (a loop)

- . What kinds of loops are we familiar with? (GOTO, IF-THEN)

- . Why do we need an IF-THEN statement in the above program? (We want the procedure to be repeated up to and including the tenth time. We want the program to stop at that time.)

- . What would happen if we left out line 20 in Sample 1? (We would have created an infinite loop. It would repeat the sentence endlessly.)

- . What is the purpose of writing ">10" in line 40 in Sample 2? (We tell the computer that we don't want the loop to be repeated more than ten times.)

. What is the name of a loop that repeats a procedure a specified number of times? (a controlled loop)

. What is the advantage of a controlled loop? (A controlled loop lets us know in advance how many times we want a procedure repeated.)

. Why don't we send the loop to line 10 in our GOTO statement in both sample programs? (We want the computer to add one count each time it completes a loop. We don't want it to begin at "1" each time it returns to the starting point.)

. What is the purpose of line 10? (Line 10 tells us the number at which we want to begin counting.)

. What does line 40 do in program Sample 1? (It adds one each time the loop is completed. It counts for us.)

. What does line 20 do in program Sample 2? (It adds one each time the loop is completed. It counts for us.)

. We will learn another way of counting using another kind of loop. This loop is a controlled loop. It is called a FOR-NEXT loop.

Development:

The FOR-NEXT statement is like a sandwich. The "FOR" is the top piece of bread and the "NEXT" is the bottom piece of bread. The stuffing (peanut butter, tunafish, etc.) is in between the FOR and the NEXT and consists of what we want the computer to do.

```
10 FOR X=1 TO 10
20 PRINT X
30 NEXT X
```

1. What will the computer do? (It will count from 1 to 10.)

2. What else will it do? (It will print the numbers from 1 to 10.)

3. Rewrite the sample FOR-NEXT program and change line 20 to read "I do repeat myself."

4. RUN the program and explain what takes place. (The computer prints the sentence ten times.)

5. What does the "X" represent? (a numeric value)

6. What does the "1" represent? (the initial value or the value at which we want the computer to begin counting. We want the computer to begin counting at "1".)

7. What does the "ten" represent? (the number at which we want the computer to stop counting. We want the computer to stop counting at 10.)

8. Why do we use "NEXT"? (After the number "one" the "next" number is 2 and so forth until we reach the number 10.)

9. Run the following program:

```
10 FOR J=1 TO 5
20 PRINT "HELLO";J
30 NEXT J
```

10. What will the computer do? (It will count from 1 to 5.)

11. What else will it do? (It will print "HELLO" 5 times.)

12. Why will the numbers 1 through 5 appear on the screen? (The computer was instructed to print the number represented by "J" after it printed the word "HELLO".

13. What symbol tells the computer to print the number right next to "HELLO"? (the semicolon)

14. Look at the two programs listed below. How are they different?

```
10 LET N=1                         10 FOR N=1 TO 10
20 LET N=N+1                       20 PRINT N
30 PRINT N                         30 NEXT N
40 IF N>10 THEN END
50 GOTO 20
```

(The FOR-NEXT program is shorter, less complicated, and therefore, more convenient.)

15. How can we use a FOR-NEXT loop to develop a program that counts from 10 to 20?

```
10 FOR X=10 TO 20
20 PRINT X
30 NEXT X
```

16. How do we make the computer count by 2's from 4 to 16?

```
10 FOR J=4 TO 16 STEP 2
20 PRINT J
30 NEXT J
```

17. What does the word "STEP" do? (It tells the computer to PRINT "4", then take 2 steps and print the next number, which is 6, then take 2 more steps, print the next number, and so forth.)

18. What will the output look like?

```
4
6
8
10
12
14
16
```

19. What would happen if we left out the FOR or the NEXT in a program? (We would get an error message. We cannot have FOR without NEXT.)

20. What does the computer do after it completes the loop and repeats the process until it hits 16? (At that point it stops.)

Application:

What will be the outcome of each of the following programs?

1. Write a computer program which prints the numbers 1,2,3,...50 on the screen.

2. Write a computer program which prints the numbers 2,4,6...50 on the screen.

3. Write a computer program which prints the numbers 1,2,4,7,11,16,...50 on the screen.

TOPIC 74
FOR-NEXT Loop in Time Delays and Counting Backwards

Aim: How Can We Use the FOR-NEXT Loop to Write More Advanced Programs?

Performance Objectives: Students will be able to:

- define each of the following loops: endless (infinite); bailout (controlled); automatic controlled
- analyze and use each of the above named loops in simple programs
- use the FOR-NEXT loop in counting backwards
- use the FOR-NEXT loop as a time-delay

Vocabulary: New: time delay, negative increment, automatic controlled loop
Review: controlled loop, GOTO, IF-THEN, STEP, FOR-NEXT

Motivation: Write a program that will print "I will never stop going." over and over again.

Sample:

```
10 PRINT "I will never stop going."
20 GOTO 10
```

- What kind of loop is this? (Is it endless, or is it conditional?)

- Write a program that prints "I'll stop repeating myself when I'm 10." ten times. Use the PRINT statement only once and use GOTO and IF-THEN.

Sample:

```
10 N=0
20 PRINT "I'll stop repeating myself when I'm 10."
30 N=N+1
40 IF N=10 THEN END
50 GOTO 20
```

- What kind of loop is used? (conditional)

- What does a conditional loop do? (It repeats itself until a certain condition is met.

- What loops are used in this program? (GOTO, IF-THEN)

- Which loop tests to see if the condition is met? (IF-THEN)

- When will the condition be met? (When we reach 10 the condition will be met and the program will end.)

- Name the variables in the above sample program:
  counter variable (N)
  initial value (0)
  increment (+1)
  limit value (10)

. Rewrite the program above using a FOR-NEXT loop.

```
10 FOR N=1 TO 10
20 PRINT "I'll stop repeating myself when I'm 10."
30 NEXT N
```

. What kind of loop is this? (automatic controlled loop)

. How is it different from the controlled loop? (We can skip the steps for increasing the number and we can skip the testing steps. The computer keeps count for us automatically.)

Development:

. How can we keep a message on the computer for a certain amount of time? (We can instruct the computer to count.)

. What is a time delay? (It occurs when the computer counts and holds the message on the screen until it is finished counting.)

. What is the computer told to print in the following program:

```
10 PRINT "I'll hang out with you for about 10 seconds."
20 FOR S=1 TO 3300
30 NEXT S
40 END
```

(The computer prints "I'll hang out with you for about 10 seconds."

. What will the computer do after it prints the message? (It will count to 3300.)

. How long do you think it will take for the computer to count to 3300? (Use a stopwatch or second hand on a watch or clock to test the time factor. The answer should be approximately 10 seconds.)

. How is a time delay program different from the counter program in the previous program? (The time delay prints a message, counts and holds the message on the screen, then goes to the next line number. The counter program shown earlier prints a message and then keeps printing it until it has printed the message a certain number of times.)

. Can we make the computer count backwards?

. What arithmetic function do we use to count backwards? (subtraction)

. What computer word tells us how many steps to take when we count by 2's, 3's, etc.? (STEP)

. If we want to subtract 1 each time to count backwards from a certain number, what instruction should we give the computer? (STEP -1)

- What will the computer's output be in the following program:

```
10 FOR T=20 to 2 STEP -2
20 PRINT T
30 NEXT T
```

(The computer will print 20, 18, 16, 14, 12, 10, 8, 6, 4, 2, in a vertical column.)

- What name do we use when we count forwards, increasing each number by a specific amount? (increments) What name do we use when we count backwards, decreasing each number by a specific amount? (decrements)

- Write a program that shows you how to count backwards from 99 to 3 by 3's?

```
NEW
10 FOR I=99 to 3  STEP -3
20 PRINT I
30 NEXT I
```

Application:

Determine the output of each program:

```
10 FOR T=59 TO 0 STEP -1
20 PRINT T
30 NEXT T
```

(This program counts backwards from 59 to 0 in the sequence 59, 58, 57, 56, 55, 54, etc.)

```
NEW
10 PRINT "I'm waiting."
20 FOR N=1 to 1000
30 NEXT N
40 PRINT "That was not so long."
```

(This program prints the message "I'm waiting", holds it on the screen for approximately 3 seconds, then prints the second statement, "That was not so long.")

- Write a program that will print a message of your choosing on the screen. Write the program so that the message stays on the screen for 2 seconds and then prints "That is equal to 2 seconds.

Summary:

Explain each of the following loops: bailout, controlled, automatic controlled

- How do we make the computer count backwards?

- In what kind of program would you want to count backwards?

- How do we use the time delay?

- When might you want to use a time delay?

Exercises:

- Write a program that counts backwards from 80 to 40 by 4's.
- Write a program that prints the names of each member of your family and holds each name on the screen for 3 seconds. (1 second = 1 to 330)

Determine the output of this program:

```
10 FOR X = 1 TO 5
20 PRINT "FURRY FRIENDS"
30 FOR T = 1 TO 660
40 NEXT T
50 NEXT X
```

(This program shows a loop within a loop. It is called a nested loop. To determine the output of this program think of lines 10, 20, and 50. Then think of lines 30 and 40. What will these groups of lines do?)

TOPIC 75
The READ/DATA Statement - One Variable

Aim: How Can We Write a Program With More Than One Item of Data Entered at a Time?

Performance Objectives: Students will be able to:

- properly input data using READ-DATA statement
- compare the READ-DATA statement with the INPUT statement in terms of usefulness
- write a simple program using READ-DATA
- identify common errors made while using READ-DATA
- identify and understand an out of data error message

Vocabulary: New: READ/DATA, O/D (out of data),
Review: PRINT, LET, INPUT, STEP

Motivation:

Write a program that will PRINT 10, 20, 30, 40

```
10 LET X=10
20 PRINT X
30 LETX= 20
40 PRINT X
50 LETX= 30
60 PRINT X
70 LETX= 40
80 PRINT X
90 END
```

OR

```
10 FORX= 10 TO 40 STEP 10
20 PRINT X
30 NEXT X
40 END
```

OR

```
10 INPUT A
20 PRINT A
30 GOTO 10
40 END
```

- How does the output differ in each program?
- How would you write a program that will print 10,14,16,20?

```
10 LETX=10
20 PRINT X
30 LETX= 14
40 PRINT X
50 LETX= 16
60 PRINT X
70 LETX= 20
80 PRINT X
```

. Why can't we use a FOR-NEXT loop for the above program? (the steps are not in equal increments, i.e., amounts)

. Can you use an INPUT statement to write a similar program? (An INPUT statement can only be used if the person RUNNING the program has a list of the numbers that must be entered through the keyboard.

. Can we write a program like this which is shorter?

. Can we find a way to enter all the numbers at once?

Explain: The numerical values entered are known as data. Data contains information needed for the program.

Development: Here is a new way to write the above program:

```
10 READ X
20 PRINT X
30 DATA 10,14,16,20
40 GOTO 10
50 END
```

. Did we know the values of X ahead of time? (yes)

. What do we call this information? (data)

. Where is it stored? (near the end of the program)

. What does the computer do when it sees a READ statement? (It reads the values in the DATA statement.)

. What does the DATA statement do? (It stores the values for the READ statement to use in the program.)

. Look at the DATA statement. What punctuation mark is used when recording the values? (A comma is used to separate each value in the DATA statement except after the last value. There is nothing after the last value.)

. If READ statements must look for information in the DATA statement, can a program using READ work without a DATA statement? (no)

. If the values in the DATA statement must be "read" in order to process the information, can we have a DATA statement before having a READ statement? (no)

. What kind of statement is READ/DATA? (loop)

. How many times does this program loop? (4)

. What happens after the fourth loop? (There is no more data available and we get an "out of data" error message.)

. Can we use a READ/DATA statement with string variables?

. When might we want to do this?

. Suppose we are having a party and we want to write invitations to five friends named Scott, Lisa, Luis, Michael, and Tanya?

. Write a short program to complete this task using a READ/DATA statement.

Sample:

```
10 READ N$
20 PRINT"Dear ";N$;","
30 PRINT"Please come to my birthday party"
40 PRINT"Sunday,June 12th, at 4:00 P.M."
50 PRINT
60 PRINT"Your friend,"
70 PRINT"Amy"
80 DATA Scott, Lisa, Luis, Michael, Tanya
90 GOTO 10
100 END
```

. How is the READ statement different in this program? (READN$; The computer can read string variables as well as numerical values.)

. How is the DATA statement different? (The DATA statement has string variables instead of numerical values.)

. How are the READ/DATA statements similar in both programs? (The values in both programs are separated by commas in the DATA statement.)

. Let's write an alphabetical list of these friends using their last names first and their first names last.

```
10 READ N$
20 PRINT N$
30 DATA"ALAN,SCOTT","TOLCHIN,LISA","VEGA,LUIS","WILLIAMS,MICHAEL",
   "YOUNG,TANYA"
40 GOTO10
50 END
```

. How is the READ/DATA statement different in this program? (The string variable contains punctuation marks to separate each piece of data.)

Application:

Using READ/DATA write a program that will print a list of the primary colors - red, yellow, blue.

```
10 READ C$
20 PRINT C$
30 DATA RED,BLUE,YELLOW
40 GOTO 10
50 END
```

Summary:

- What kinds of variables follow READ?
- What kinds of variables follow DATA?
- Where must DATA appear in the program?
- What punctuation mark separates DATA values?
- What must accompany every READ statement?
- What is the difference between the use of the INPUT statement and the READ/DATA statement?
- What are the advantages of a READ/DATA statement? INPUT? When would you use each?

Exercises:

Find and correct the error in each of the READ/DATA statements below:

```
10 READ A
20 DATA JOE,MARY,SUE
10 DATA 6,4,8
20 READ N
10 READ 5
20 DATA 12,31,41
READ X
DATA 9,0,1
```

Rewrite each program using READ/DATA.

```
10 INPUT A$
20 PRINT"YOURNAMEIS";A$

10 LET A=3
20 PRINT A
30 LET A=5
40 PRINT A
50 LET A=7
60 PRINT A
```

Write a short thank-you note to each of the friends who came to your birthday party.

TOPIC 76
READ/DATA Statement - Avoiding O/D Error Statement

Aim: How Can We Avoid Getting an Out Of Data Error Message?

Performance Objectives: Students will be able to:

- identify and use a trailing value in a DATA statement to avoid an out of data error message.
- write a program using an IF-THEN statement to avoid getting an out of data error message.

Vocabulary: New: Pointer, Trailing value
Review: Flag, IF-THEN, READ/DATA

Motivation:

Write a program that will print the numbers 2, 3, 4, 8 using a READ/DATA statement.

```
10 READ N
20 PRINT N
30 DATA 2,3,4,8
40 GOTO 10
50 END
```

What happens when you run this program? (We get an out of data error.)

Development:

Copy this program onto your keyboard and run it.
(Guess the output before keyboarding "RUN".)

```
10 READ N
20 PRINT N
25 IF N= -1 THEN50
30 GOTO 10
40 DATA 2,3,4,8,-1
50 END
```

- How many lines were in the first program?
- How many lines were in the second program?
- Which line was added?
- How did this one addition change the program? (We didn't get an out of data error message.)
- What was different about the DATA statement in this program? (line 40)
- What did the second program contain in line 40 that the first did not? (-1 in the DATA statement)

- What was the computer instructed to do when it received a reading of -1? (GOTO50)

- What does line 50 do? (It ends the program.)

Explain:

The statement "READN" tells the computer to look for a DATA line. It picks out the first value in the line. The program performs the operation (in this case it prints the value) and produces the output (the number 2). The statement "GOTO 10" loops the program back to "READN". There is an internal POINTER which forces the computer to read the next value in the DATA line as a value for N. This process continues until all the values in the line have been used.

- How many times will the computer go through this processing loop in any program? (It will go through this loop until all the items in the DATA have been used.).

- In the above program what happens after the process has been repeated 4 times? (On the fifth time the -1 is read. The computer is directed to line 50 instead of 10 which ends the program.)

- Why don't we get an out of data message? (The program has been directed out of the loop process to a new line which says "END".

- What can you compare the -1 to? (It acts like a policeman directing traffic, a stop sign, a flag, a signal.)

Explain:

We call this value in a DATA statement a flag or a trailing value.

- Must we use a -1 as a flag? (Any number will do as long as we have an IF-THEN statement directing the computer process and as long as the numb used as a flag is not part of the program's data.

- How can we put in a flag or trailing value if we are using string variables? (We use letters instead of numbers.)

Sample:

```
10 READN
20 IFN="XXX" then 60
30 PRINT N$
40 GOTO 10
50 DATA "JOHN","CAROL","XXX"
60 END
```

. We can also avoid an out of data message by printing an end of data message and ending the program:

```
10 READ N
20 PRINT N
30 IF N=0 THENPRINT"ENDOFDATA":END
40 GOTO 10
50 DATA1893,1984,1492,0
```

Application:

Write a program listing three animals in alphabetical order using IF-THEN and a flag to avoid an out of data message.

```
10 READ A$
20 IF A="XXX"THEN 60
30 PRINT A$
40 DATA"CAT","DOG","MONKEY","XXX"
50 GOTO10
60 END
```

Application (advanced):

We can use a computer to convert inches to centimeters. If 1 inch = approximately 2.54 centimeters then 2 inches = 2*2.54 centimeters and X inches = X* 2.54 centimeters.

Write a program which will convert the following inches to centimeters:

1, 2, 3, 36, 58, 72. Use a flag and an IF-THEN statement to avoid an out of data error.

```
10 READ I
20 LET C=2.54
30 T=I*C
40 IFI=-1 THEN PRINT "THAT'S ALL,FOLKS":END
50 PRINT I;"INCHES=";T;"CENTIMETERS"
60 DATA 1,2,3,4,-1
70 GOTO 10
```

OR

```
10 READ I
15 IFI=-1 THEN 60
20 X=I/.39
30 PRINT I;"INCHES";X;"CENTIMETERS"
40 GOTO 10
50 DATA 1,2,3,4,-1
60 END
```

Summary:

- What is an internal pointer?
- What is a flag?
- How is a flag used?
- What statement can you use to avoid an out of data error?
- What kind of variable would you use when working with numbers?
- What kind of variable would you use when working with words?

Exercises:

Which IF-THEN statements are valid?

```
IF A$=-1 THEN60
IF A="BBB" THEN60
IF A=3 THEN 60
IF B$=BBB THEN60
```

- You have just borrowed $1000.00 from your parents. You promised that you will pay them back in 10 years at a fixed rate of interest. The amount of interest may vary according to the economy. The rates may be .08,.09,.10,.11,.12. Print out the different amounts of interest you might have to pay at each rate.

Avoid an out of data error message.

Hint: Principal * Rate * Time = Interest

```
Let P=1000
    T=10
    I=P*R*T
```

Data will consist of the various rates of interest.

Write a program that will read five test scores and print out the average.

Use READ/DATA. Avoid O/D error message.

TOPIC 77
READ/DATA Statements Using Multiple Variables

Aim: How Do We Use READ/DATA With More Than One Variable?

Performance Objectives: Students will be able to:

- provide values for more than one variable using a READ/DATA statement
- identify errors commonly found when using a READ/DATA statement with more than one variable
- write a program with more than one variable using a READ/DATA statement

Vocabulary: New: Multiple variables
Review: READ/DATA, value, variable, pointer

Motivation:

Examine programs A and B for similarities and differences:
Program A

```
10 REM THIS PROGRAM CALCULATES DISTANCE TRAVELED
20 REMR=RATE
30 REMT=TIME
40 REMD=DISTANCE
50 PRINT "INPUTT"
60 INPUTT
70 LETR=55
80 LETD=R*T
90 PRINTD
100 GOTO50
```

Program B

```
10 REMR=RATE
20 REMT=TIME
30 REMD=DISTANCE
40 PRINT"INPUTT"
50 INPUTT
60 INPUT"INPUTR"; R
70 PRINTR
80 LETD=R*T
90 PRINT"R*T=D"
100 PRINTD
```

- How do the programs differ? (In program B the user inputs two variables.)
- What is the advantage of inputting two variables? (Program B allows us to vary not only the time but the rate as well.)
- Can you change one of these programs into a READ/DATA program instead of using INPUT?

Program A (modified)

```
10 REM R = RATE
20 REM T=TIME
30 REM D =DISTANCE
40 READR
50 PRINTR
60 LETT=3
70 LETD=R*T
80 PRINTT
90 PRINT"R*T=D"
100 PRINTD
110 DATA55,45,60
120 GOTO40
```

- What is the purpose of using a READ/DATA in the above program? (It eliminates the need for user input of data.)

- How can this be an advantage? (It is faster and more efficient.)

- Suppose instead of a fixed rate of speed or a fixed period of time we chose to consider different rates of speed and different periods of time? For example, suppose we wanted to compare different modes of travel such as bike, train, or car.

  How could we compare the rate of speed for each as well as the time spent in traveling? (We would need two variables as in program B)

- We know that READ/DATA is more efficient. We have used READ/DATA with one variable. Can we use it with more than one variable?

Development:

1. We want to vary the rate of speed as well as the amount of time spent traveling in order to determine how far we have gone. How many variables would we be working with? (R and T)

2. How would these variables appear in the READ statement? (READR,T)

3. READ cannot appear in a program without its other half. What is its name? (DATA)

4. How should the DATA line be arranged so that the computer can find the correct values for R and T? (The values in the DATA line must be in groups of two and must be in the proper order according to the variables called for.)

5. How does the "internal pointer" work with the READ/DATA statement using multiple variables? (The pointer reads one piece of data for each variable in the READ statement.)

<u>Sample</u>:

```
10 READN$,A
20 PRINTN$,A
30 DATA JOHN, 12, MARY, 10, JOE, 13
40 GOTO10
```

6. What will the output be in this program? (The computer knows to expect two values on each pass so it will first read and print "JOHN12", then it will go on to the next set of two values, and so forth.)

7. How would we rewrite program B using READ/DATA with multiple variables?

Program B (modified)

```
10 REMR=RATET=TIMED=DISTANCE
20 READR,T
30 PRINT"RATE="
40 PRINTR
50 ?"TIME ="
60 ?T
70 ?"R*T=D"
80 ?"DISTANCE="
90?D
100 DATA55,3,60,4
110
```

Note: This program will be too long to appear in total on the screen. The following program will accomplish the same purpose and will appear in total.

Program B (modified 2)

```
10 REMR=RATET=TIME D =DISTANCE
20 READR,T
30 LETD=R*T
40 PRINT"RATE";R
50 PRINT"TIME";T
60 PRINT"R*T=D"
70 PRINT"DISTANCE=";D
80 DATA 55,3,60,4
90 GOTO 20
```

8. Suppose a program has the following two lines in it:

```
50 READA,B,C
90 DATA 20, 2, 12, 30, 3, 13, 40, 14, 4
```

How will the computer sort this out? (Because three variables have been given in the READ statement, the computer knows to look for three values in the DATA statement. On the first pass, the first three values; 20, 2, 12, are assigned to the variables. On the second pass the next three values; 30, 3, 13, are assigned, etc.)

Application:

Write a program which lists the following four members of a basketball team and the number of baskets they score in a game.

Put the information in DATA statements and print out the list in columns.

Note: The order of the data is string, number, number, number.

Michele	10	12	13
Sharon	9	11	10
Linda	11	13	14
Mark	17	12	15

Though more than one set of data can appear on a data line, for reason of screen width, it might be necessary to use more than one DATA line.

Commas separate data except at the end of the data line.

Program:

```
10 READN$,A,B,C
20 PRINT N$,A,B,C
30 DATA Michele,10,12,13
40 DATA Sharon,9,11,10
50 DATA Linda,11,13,14
60 DATA Mark,17,12,15
70 GOTO10
```

Summary:

1. If a program uses a READ line, what other line must appear in the program?
2. Why must a programmer be careful when arranging the values in a data line?
3. How does the internal pointer handle sets of DATA values for multiple variables?

Exercises:

1. Find and correct any errors in each READ/DATA statement below:

```
10 READJ,K,L,M
30 DATA5,10,15
```

```
10 READD;E;F
20 DATA2,4,6
```

```
10 DATA$2,$3,$4
20 READD,E,F
```

```
10 READM$,N
20 DATA 28,"JOHN",31."MARY"
```

```
10 READ U,W,
20 DATA2,3,4,5,6
```

2. Write a program to list the names of five friends. Find out and list each one's favorite food and each one's least favorite food.

3. Type in the following program. Complete the DATA statement with the names of three of your favorite things. (e.g. foods, activities, people, etc.)

```
10 READ A$, B$, C$
20 PRINT "I love";A$,B$,C$
30 GOTO 10
40 DATA
```

TOPIC 78

Integer and Random Number Functions

Aim: How Can a Computer be Programmed to Pick a Number at Random?

Performance Objectives: Students will be able to:

- define and explain the purpose of the terms RANDOM and INTEGER
- use the INT and RND functions in a program

Vocabulary: New: integer (INT), random (RND)
Review: FOR/NEXT, INPUT

Motivation:

1. Write a program which asks the user to guess a number between 1 and 10. If the person doesn't get the number on the first try, let's give him another chance. Tell him if he is guessing too high or too low.

```
10  INPUT "I'm thinking of a number between 1 and 10.  Type  your
guess for the number."; A
20 N = 7
30 IF A=N THEN PRINT "YOU ARE RIGHT":END
40 IF A < N THEN PRINT "TOO LOW. TRY AGAIN.":GOTO10
50 IF A > N THEN PRINT "TOO HIGH TRY AGAIN.":GOTO10
```

2. How long might the user want to play this guessing game the way it is? (Not very long, since the user will guess the number after a few tries and he or she will then know it. Therefore, it wouldn't be a guessing game the second time it would be run.)

3. What would we have to do in order to change the hidden number? (We have to change the value of N in line 20.)

4. What would be the best solution? (If the computer could pick its own secret number then the game could be repeated.)

Development:

1. What is the advantage of working with whole numbers instead of decimals? (It is easier for the user to understand.)

2. What word means whole numbers? (integer)

3. What is the BASIC designation? (INT)

4. Define an integer. (An integer is any whole number, positive, negative, or 0.)

5. Let's use the INT function. Type in this program:

```
10 INPUT N
20 R=INT(N)
30 PRINT N,R
40 GOTO10
```

6. RUN this program using the following values for N:

```
 10
  0
 -5
 3.5
-3.5
```

7. Explain the output in each case:

```
  10, 10
   0,  0
  -5, -5
 3.5, 3
-3.5, -4
```

8. In the last example , why did -4 appear? (-4 is smaller than -3.5.)

9. Can you guess the output for the following values?

```
N = INT (7.2)
N = INT (-8.9)
N = INT (7.7)
```

10. Answers:

```
 7.2, 7
-8.9, -9
 7.7, 7
```

Pattern: The integer is rounded down to the nearest whole number.

11. What function do we use if we want the computer to pick a number at random instead of waiting for our INPUT? (The RANDOM function tells the computer to pick a number.)

12. What does RANDOM mean? (unpredictable - like the numbers in the lottery)

13. What is the BASIC designation? (RND)

14. Type this program:

```
10 N = RND(0) or
10 N = RND(1) (The method of writing the RANDOM function may be different
       on a different brand of computer.)
20 PRINTN
```

15. What is the result? (The computer picks a number (N) between 0 and 1.)

16. How can we get the computer to pick a whole number? (We use the INT function.)

17. Type

```
10 N = INT (RND(0)) or
10 N = INT (RND(1))
20 PRINTN
```

18. What happens? (The computer always prints 0 because with the INT function the computer uses the number before the decimal point. It doesn't round off.)

19. What operation could we perform to give us a greater range of numbers? (We can multiply RND by a number.)

20. How would this look?

```
N = INT(X*RND(0)) or
N = INT(X*RND(1))
```

21. How do we write the value for X? (We use a LET statement or insert the value for X in the program line.)

22. How do we choose the value for X? (As the value of X increases, the range of numbers the computer can choose from also increases.)

23. How can we get the computer to choose a value between 1 and 10 ?

```
N = INT (10*RND(0)+1) or
N = INT (10*RND(1)+1)
```

24. How do we get the computer to pick a number from 1 to 6?

```
N = INT (6*RND(0)+1) or
N = INT (6*RND(1)+1)
```

25. Not all computers generate random numbers in the same manner.

26. Note the differences in the following program and the notations for each machine:

```
10 LETD=RND (10)
20 LETX=RND (10)
30 PRINTD
40 PRINTX
```

27. The above program is for Radio Shack TRS-80 machines. The 10 tells the computer to pick a number from 1 to 10.

28. The following program is used on the APPLE and PET machines:

```
10 LETD=INT(RND(1)*10)+1
20 LET X =INT(RND(1)*10)+1
```

29. The above program turns decimals into whole numbers. The 10 tells the computer to pick a number from 1 to 10.

Application:

1. Match column I with its correct answer in column II.
   (Note that one answer from column II is used twice.)

I	II
1. RND(1)	a. 0
2. INT(2.2)	b. numbers from 1 to 4
3. RND(0)	c. 2
4. INT(4*RND(1))	d. -8
5. INT(RND(1))	e. numbers greater than 0 . 6. INT(-7.9) but less than 1
6. INT(4*RND(0)+(1)	f. numbers from 0 to 3

2. Write a program that will print 25 numbers chosen at random in the range of one to ten.

```
10 FORX=1 to 25
20 X = INT(10*RND(0)+1)
30 PRINT X
40 NEXT X
```

Summary:

1. What is the most useful form of the RND function for generating random whole numbers? N=INT(X*RND(0)+ 1)

2. What does each part of that equation do? (The X tells you how many numbers to choose from and is also the highest number. The 1 tells you that the lowest number will be 1.

3. What happens when you use the INT function with any positive number? (The computer prints only the whole number before the decimal point.)

4. What happens when you use the INT function with a negative number? (The computer will print the next lowest number, e.g., INT (-6.3) = -7.)

Exercises:

1. Write a program which will print random numbers from 1 to 75 across the screen.

2. Write a program which will print random numbers from 1 to 12 in columns on the screen.

3. Write a program that will allow the user to guess a number between 1 and 25.

TOPIC 79
Generating Random Numbers in Programs

Aim: How Can The INT and RND Functions Be Used in Programming?

Performance Objectives: Students will be able to:

- explain how INT and RND are used in a program
- use the INT and RND functions in creating programs of chance such as coin tossing and dice

Vocabulary: Review: INT, RND

Motivation:

1. If you were tossing a coin what kind of bet could you make on the outcome of the toss? (Heads or tails.)

2. How can a computer flip a coin? (We could use the RND function to allow the computer to choose between the numbers 1 and 2 to determine if it tossed heads or tails.)

3. What formula could we use to choose two random numbers, 1 and 2 ?

    - X =INT(2*RND(0)+1)

4. How would we be able to tell if it came up heads or tails?

    - IFX=1 THENPRINT"HEADS"
    - IFX=2THENPRINT"TAILS"

5. Can we write a computer program to play this game?

Development:

1. Let's write a program to toss a coin. What must we ask the user to do? (Guess whether the coin comes up heads or tails.)

2. Would the user be able to bet money? (If we allow for it.)

3. How does the person know if the coin comes up heads or tails? (We must show what the result is.)

4. After the coin is flipped, what must be shown? (Decide if the person is right.)

5. How do you show the person if he guessed right or wrong? (Use an IF-THEN statement.)

6. What can we tell him after that? (We can ask him if he would like to bet again.)

```
10 INPUT "Would you like to place a bet on a coin flip?";B$
20 IF B$ ="YES"THENPRINT"GREAT":ELSE END
30 INPUT"What's your bet?";S
40 INPUT"TYPE 1 FOR HEADS, 2 FOR TAILS"; A
50 X=RND(2) REMTRS-80
60 IFX =1 THENPRINT"HEADS"
70 IFX=2 THENPRINT"TAILS"
80 IFX= ATHENPRINT"YOU WIN"  REM If RND # = better's choice
90 IFX<>ATHENPRINT"YOU LOSE." REMRND# is not the same as the better's
   choice
100 GOTO10
```

- How can you write a program which will generate two different numbers at random, add the numbers together, require the user to INPUT the answer to this problem and then tell the user if the answer is correct or incorrect?

```
10 LETA=INT(RND(40)) or 10 LETA= INT(RND(1)*40)+1
20 LETB = INT(RND(20))
30 LETC=A+B
40 PRINTA; "+";B;"="
50 INPUTX
60 IFX=CTHENGOTO90
70 PRINT"SORRY, YOU'RE WRONG. TRY AGAIN."
80 GOTO40
90 PRINT"CORRECT"
```

Application:

1. Play the coin toss game.

2. Give the user $25.00 to start and allow him to bet a specific amount each time around.

3. Give him $25.00 to start and let him bet any amount he chooses.

4. Show the amount of money the bettor now has available by adding or subtracting the amount of the bet from the total.

5. Write a flowchart for any of the above programs for this game.

6. Write a flowchart showing the above program which generates two random numbers, adds them, etc.

Summary:

1. How do we combine INT and RND functions to generate random numbers from 1 to X?

2. What are some good techniques to use when writing programs using the RND function?

3. How can we use some of the tricks we have learned to make our programs more professional? (REM, IF/THEN, CLEARSCREEN, COUNTERS, TIMEDELAYS, FOR-NEXT.

<u>Exercises</u>:

1. Write a program to simulate rolling a die twenty times and print the number of times the die comes up five. Remember, a die has six sides, so we could roll any number from one to six.

   <u>Sample</u>: (After this you are on your own.)

```
10 REM ROLLING A DIE AND KEEPING SCORE
20 FORN=1 to 20  REMThe Counter
30 X=INT(RND(6))  REMTRS-80
40 IFX=5 THENv=v+1 REMCounts the five's : PRINT"THAT'S"V "FIVE'S."
50 FORT=1 TO500: NEXTT REM Timer for each roll of the die to remain on the
   screen before the next roll appears.
60 PRINTX REMThe roll
70 NEXT N REMClosing the loop to begin the next roll- line 20
80 END
```

2. We have two dice and we roll them at the same time. Write a program to determine how many times we will roll a lucky 7 out of the 25 rolls.

3. Rewrite the program to allow the computer to select the number which will be the winning one.

4. Write a program to play a game of dice. These are the rules:

   . If you roll a 2, 3, or 12 you lose automatically.
   . If you roll a 7 or 11, you win.
   . If you roll a 4, 5, 6, 8, 9, or 10, you must roll the dice again.

5. Write the above program and change the last rule to the following:

6. If you roll a 4, 5, 6, 7, 8, 9, or 10, that number becomes your point and you must roll again. You continue to roll the dice until you automatically lose or win.

7. Write the flowchart for one of the above programs.

TOPIC 80
Apple Graphics

Aim: How Can You Make Pictures on a Computer Monitor?

Performance Objectives: Students will be able to:

- understand the structure of the computer monitor as it applies to graphics
- explain the commands used to generate computer graphics
- use the commands to create pictures and designs

Vocabulary: graphics, grid, plot, VLIN, HLIN

Motivation:

1. Choose two teams to play tic-tac-toe on the board by directing placement, according to coordinates, of the team's symbol. The first team to place its symbols in a straight line is the winner.

2. Choose two teams to direct, with the use of coordinates, a "pupil cursor" to fill in boxes on a grid which will form an assigned shape, e.g., square, initial, realistic picture. The first team to complete the task is the winner.

Development:

1. Define computer graphics as pictures on a computer monitor made with the use of light and/or color.

2. Illustrate graphics by running a program which had been prepared earlier e.g.,:

```
  5 REM  HAPPY FACE
 10 GR
 20 HOME
 30 HOME
 40 COLOR= 15
 50 HLIN 11,29 AT 8
 60 HLIN 11,29 AT 30
 70 VLIN 9,29 AT 11
 80 VLIN 9,29 AT 29
 90 PLOT 15,14: PLOT 16, 14: PLOT 15,15: PLOT 16,15
100 PLOT 24,14: PLOT 25,14: PLOT 24,15: PLOT 25,15
110 VLIN 14,22 AT 20
120 PLOT 19, 22: PLOT 21,22
130 HLIN 16,24 AT 27
140 PLOT 15,26: PLOT 25,26
150 END
```

3. Distribute graph paper with x and y coordinates numbered. Relate the computer monitor to the grid of a graph.
    a. Teacher demonstration model.
    b. Student graph paper and/or acetate overlay of grid on monitor screen.
    c. Explain x and y coordinates.

   d. Practice locating boxes on the grid.
   e. Practice plotting on the grid.

4. Develop with the children the understanding that:
   a. The computer grid has 40 boxes across and 40 boxes down.
   b. The first box is numbered zero, therefore the boxes across are numbered 0 to 39 and the boxes down are numbered 0 to 39.

5. Each box on the grid has a name made of its place number across followed by its place number down (a mnemonic device which may be helpful to young children is that "a" comes before "d", therefore the "across" number comes before the "down" number.)

6 The computer command PLOT tells the computer to light up a square. The numbers following tell the computer which square should be lit, e.g., PLOT 13,4. A picture can be drawn by lighting a pattern of boxes.

7. The APPLE can produce 16 colors. (Prepare and display a chart listing the color selections as shown below.)

0 black
1 red
2 dark blue
3 lavender
4 dark green
5 grey
6 medium blue
7 light blue
8 brown
9 orange
10 grey
11 pink
12 green
13 yellow
14 aqua
15 white

The command COLOR, an equal sign, and the number of the color you want tells the computer in which color the square should be lit, e.g., COLOR= 5

8. The computer usually uses the screen to display words. This is called the text mode. To tell the computer you want it to display pictures instead of words you must put it into the graphics mode. This is done by typing GR at the beginning or your program. The bottom four lines of the screen will still be reserved for text or words.

9. The sequence of lines in a graphics program is:

```
10 GR
20 COLOR= --
30 PLOT --,--
```

10. Use worksheets 1 - 5 to illustrate and practice the COLOR and PLOT commands.

11. The commands VLIN and HLIN tell the computer to draw a vertical and/or horizontal line on the screen. Columns are vertical. There are 40 of them, numbered 0 to 39. VLIN 12,30 AT 5 instructs the computer to draw a vertical line from square 12 to square 30 at column 5. Rows are horizontal. There are 40 of them, numbered 0 - 39. HLIN 27,37 at 8 instructs the computer to draw a horizontal line from square 27 to square 37 at row 8.

12. Use worksheets 6-8 to illustrate and practice the COLOR, VLIN and HLIN commands.

Worksheets:

1. Write a program so that the computer puts a green square on the coordinate 120,30. Count out the spaces across and down on your grid to locate the square. Now tell the computer to do this on its monitor. Remember to enter the graphics mode, assign a color and give the location.

2. Reverse the order of the coordinates in the program which you just wrote. Tell the computer to light this square on its monitor. Compare the locations of the two squares. Why are they so different?

3. Type in a location 45,10. Which command tells the computer to light a square? Use it before the coordinates. What message did you get? Can you tell why? (45 is a number not used on the grid.)

4. Write and execute a program that will print a red square in each of the four corners of the screen. Remember to go into the graphics mode, to give the color command and to name the four locations which you want lit.

5. Create a picture on your grid by filling in squares. Write the coordinates of each square you filled in. Type the program, entering the coordinates into the computer. Type RUN.

6. Write and execute a program so that the computer draws a vertical line down the middle of the screen. What is the number of the middle column? How do you tell the computer to make that line as long as the screen? Now add a horizontal line across the middle of the screen. What is the number of the middle row? Tell the computer to make that line as wide as the screen. Remember your lines can be drawn in "living color".

7. Write and execute a program so that the computer draws a tic-tac-toe design.

8. Create a picture on your grid by filling in columns and rows of squares. Write the coordinates and lengths for each. Type the program into the computer and RUN.

Applications:

1. Make a dot or rectangle move across or down the screen.

```
10 GR                 10 GR
20 FOR H = 0 TO 39    20 FOR V = 0 TO 39
30 COLOR = 5          30 COLOR = 5
40 PLOT H,20          40 PLOT 20,V
50 COLOR = 0          50 COLOR = 0
60 PLOT H,20          60 PLOT 20,V
70 NEXT H             70 NEXT V
80 GOTO 20            80 GOTO 20
```

Can you tell what each line in the two programs above does? RUN these programs and see if you were correct.

Now draw your own picture and make it move.

2. Make a survey of the colors of cars owned by the parents of your classmates. Plan a graph to illustrate your results and program it for display on the computer monitor.

Summary:

Computer graphics can be executed by using commands which locate specific squares on the monitor and instruct the computer to light those squares in any of sixteen colors.

TOPIC 81
Commodore-64 Screen Graphics

Aim: How Can you Make Pictures on a Computer Monitor?

Performance Objectives: Students will be able to:

- understand the structure of the computer monitor as it applies to graphics
- explain the commands used to generate computer graphics
- use the commands to create pictures and designs

Vocabulary: graphics, grid

Motivation:

After selecting symbols to be used, e.g., * ! ( ) , teams are chosen to plan a realistic picture using those symbols. Two teams are formed to give directions to its "team artist" to fill in lines of the demonstration graph with symbols which will make an 8-line picture. One line at a time is to be dictated. First team to complete a realistic picture is the winner.

Development:

1. Define computer graphics as pictures on a computer monitor made with the use of shapes and color.

2. Illustrate graphics on the computer by running a program which has been prepared earlier. For example:

```
10 PRINT CHR$(147)
20 PRINT "<SHIFT-U><7 SHIFT-D'S><SHIFT-I>"
30 PRINT "<SHIFT-G><2 SHIFT-A'S>5 SPACES<SHIFT-H>"
40 PRINT "<SHIFT-G>7 SPACES <SHIFT-H>"
50 PRINT "<SHIFT-G>3 SPACES<SHIFT-A>3 SPACES<SHIFT-H>"
60 PRINT "<SHIFT-G>7 SPACES<SHIFT-H>"
70 PRINT "<SHIFT-G>3 SPACES<SHIFT-A>3 SPACES<SHIFT-H>"
80 PRINT "<SHIFT-G>7 SPACES<SHIFT-H>"
90 PRINT "<SHIFT-G>5 SPACES<2SHIFT-A'S><SHIFT-H>"
100 PRINT "<SHIFT-J><7SHIFT-F'S><SHIFT-K>"
```

3. Relate the computer monitor to the grid of a graph.

   a. Demonstrate using teacher model of graph and students' graph paper and/or acetate sheets on computer monitors.
   b. The screen contains boxes across and boxes down.
   c. Any character, including a space, takes up one box on the grid.
   d. Only one character can fit into any one box.
   e. Have children press the "x" repeatedly and count how many can fit on a line.

   Press the numbers, one at a time in sequence, followed by RETURN to see how many lines can fit on the monitor.

   It should be seen that the screen grid has 40 spaces across and 25 lines down.

4. Each key with graphics symbols has the capabilty of printing two graphic characters.

   a. Look at the keyboard and identify the faces of keys.
   b. Describe the pair of graphic characters illustrated on various keys.
   c. To print the graphic pictured on the left, press the COMMODORE key and the character key.
   d. To print the graphic pictured on the right, press the SHIFT key and the character key.
   6. Have children do Worksheet 1.

5. To create a single figure, you input that figure in the same way you would a letter or number.

   PRINT "(SHIFT)Z" (RETURN) will output a diamond figure.

6. By using commands from the Program Mode and entering a series of PRINT statements which use the graphics characters and spaces, graphics can be created.

   The word PRINT, the space, the quotation marks each take up a space on the grid line. To insure proper alignment in the output all quotation marks must be in the same column.

7. Colors can be used to liven up your graphics. The Commodore 64 can produce 16 colors. (Prepare and display a chart, as below, listing the color selections.)

0 BLACK	4 PURPLE	8 ORANGE	12 GRAY 2
1 WHITE	5 GREEN	9 BROWN	13 LIGHT GREEN
2 RED	6 BLUE	10 LIGHT RED	14 LIGHT BLUE
3 CYAN	7 YELLOW	11 GRAY 1	15 GRAY 3

   Pressing the Control key and a number key before you press the graphic key will cause the figure to be printed in the assigned color. In the program mode each line can be printed in a different color if you press <CONTROL> and number key corresponding to the color you want, following the beginning quotation marks.

Worksheets

1. In the immediate mode, print each of the graphics' characters shown on the front of the keys.

2. In the immediate mode, print each of the graphics' characters in different colors.

3. In the program mode, input the program for the "Two of Spades" (see Motivation). Since spades are black, turn your card from light blue to black. The number for black is 0. Using the cursor, insert a 0 after the quotation marks on line 20. How does this affect the rest of your program?

4. Create, on your graph paper and input and run on your computer, a program for a monogram using your initials in large, colorful and fancy letters. Use the graphic and color keys.

5. Create a program that will display a picture of your house.

Applications:

1. Poll your classmates to find the countries from which their most recent ancestors have immigrated. Put this information into graph form and enter it into your computer using the graphic keys and labeling the information with text.

2. Create a cartoon character who is speaking his favorite lines. Write a program which will show this picture on your computer screen. Use the appropriate BASIC statements to animate your character.

Summary:

1. Graphic characters and color can be accessed directly from the keyboard with the use of the COMMODORE and CONTROL keys.

2. Pictures can be created by placing the desired characters in the correct positions of the computer's grid.

3. Graphic characters and color can be accessed directly. Instruct the computer to light those squares in any of sixteen colors and program it for display on the computer monitor.

TOPIC 82
IBM PC Graphics

Performance Objectives: Students will be able to:

- understand the structure of the computer monitor as it applies to graphics
- explain the commands used to generate computer graphics
- use the commands to create pictures, designs and graphs

Vocabulary: graphics, grid, medium-resolution, high-resolution, COLOR, PSET, LINE, TEXT

Motivation:

1. Choose two teams to play tic-tac-toe on the board by directing placement, according to coordinates, of the team's symbol. The first team to place its symbols in a straight line is the winner.

2. Choose teams to direct, with use of coordinates, a pupil "cursor" to fill in boxes on a grid which will form an assigned figure e.g. square, initial, realistic picture. The first team to complete the task is the winner.

Aim: How Can You Make Pictures on the Computer Monitor?

Development:

1. Define computer graphics as pictures, designs or charts on a computer monitor made with points, lines and colors.

2. Illustrate graphics by running a program which had been prepared earlier. For example:

```
10 SCREEN 1,0 : COLOR 8,0
20 LINE (40,10) - (90,10) : LINE - (70,50),1
30 LINE  - (10,50),2 : LINE  - (40,10),1
40 LINE (70,50) - (40,10),2
```

3. Relate the computer monitor to the grid of a graph.

   a. Teacher demonstration model.
   b. Distribute student graph paper with x and y coordinates numbered and/or acetate overlay on computer's screen.
   c. Explain x and y coordinates
   d. Practice locating boxes on the screen.
   e. Practice plotting on the grid.

4. Develop with children the understanding that:

   a. In medium-resolution graphics the computer grid has 320 boxes across and 200 boxes down.
   b. In high-resolution graphics the computer grid has 640 boxes across and 200 boxes down.

   c. The first box at the left edge of the screen is numbered 0 so that in medium-resolution graphics the boxes are numbered 0 to 319 across and 0 to 199 down, and in high-resolution graphics the boxes are numbered 0 to 639 across and 0 to 199 down. (KEY OFF statement must be used here to erase the display of Soft Key definitions.)

5. Each box on the grid has a name made of its place number across followed by its place number down. (A mnemonic device which may be helpful to young children is that "a" comes before "d", therefore the "across" number comes before the "down" number.)

6. The computer statement PSET places a single point on the graphics screen.

   The numbers following PSET tell the computer where that point should be placed, e.g., PSET (45,10)

7. The computer statement LINE draws straight lines, empty boxes and solid-colored boxes.

   a. To draw a line, the numbers following the LINE statement tell the computer where to start and end the line, e.g., LINE (60,150) - (1,20) The statement above draws a straight line from the point at column 60, row 150 to the point at column 1, row 20.

   b. To draw adjoining lines omit the first coordinate from a LINE statement. The computer will start drawing a line at the last point it used and will end at the coordinate you name. For example:

```
 30 LINE (60,150) - (100,90)
 40 LINE  - (140,180)
```

   The line named in 40 will begin at (100,90).

   c. To draw a box use the LINE statement and end it with a comma and the letter B. For example:

```
LINE (50,70) - (70,90), B
```

(The hue color must be named before the box. This will be explained in item 9.)

The statement above draws a square with one corner at column 50, row 70 and the diagonally opposite corner at column 70, row 90.

   d. To draw a solid-color box add the letter F (for fill) immediately after the letter B. For example:

```
LINE (50,70) - (70,90), BF
```

(Again the hue color would be named between the last coordinate and the B, See item 9.)

8. In high-resolution graphics, the graphics are always printed in white and the background is always black. No COLOR statement is used in such a program.

9. In medium-resolution graphics the IBM PC can produce different colors for the graphic and for the background. A COLOR statement chooses a background color numbered 0 to 23 and a graphics palette numbered 0 or 1. For example:

   COLOR 4,0 4 being the background color and 0 being the palette. See below for charts which name colors and their corresponding numbers.

   Such charts should be copied and displayed in class.
   The graphics statement selects a hue from the palette named in the COLOR statement. The graphics will be printed in that hue. For example:

PSET (180, 150), 3	3 in this case being the palette hue color
LINE (50, 70) - (70, 90), 2, B	2 in this case being the palette hue color
LINE (50, 70) - (70, 90), 1, BF	1 in this case being the palette hue color

MEDIUM-RESOLUTION BACKGROUND COLORS

Background color number

Hue	Dark foreground Dark background	Light foreground Light background	Light fgrnd Dark bkgrnd
Black	0	8	16
Blue	1	9	17
Green	2	10	18
Cyan	3	11	19
Red	4	12	20
Magenta	5	13	21
Gold	6	14	22
White	7	15	23

MEDIUM-RESOLUTION FOREGROUND HUES

Palette Number Palette hue number

0 1 2 3
0 Background Green Red Gold 1 Background
Cyan Magenta White

10. The computer screen can be used for text and graphics.

    a. The computer usually uses the screen to display words. This is the text mode. The SCREEN statement SCREEN 0 puts the computer into the text mode.
    b. To tell the computer you want it to display pictures instead of words you must put it into the graphics mode and tell it you will use color. To change to medium-resolution graphics, begin your program with the statement SCREEN 1,0 where 1 is for medium-resolution graphics and 0 is for color.

    To change to high-resolution graphics, begin your program with the statement SCREEN 2. No instruction for color is necessary since high-resolution graphics are only printed in black and white.

11. In the text mode words can be plotted on the screen's grid by naming coordinates with the LOCATE statement. In this statement the rows (down) are named before the columns (across). A grid numbered 1 to 25 down and 1 to 40 across in medium-resolution or 1 to 80 across in high-resolution is used. A color statement must be used to designate foreground, background and border colors. See the chart below for color selections. Prepare and display in class.

    Here is a sample LOCATE program:

```
10 W$ =  "Happy Birthday"
20 SCREEN 0,1
30 COLOR 17,12,6
40 LOCATE 12,7
50 PRINT W$
```

COLORS IN TEXT MODE

Color number	Color	Color number	Color
0	Black	8	Dark grey
1	Blue	9	Light blue
2	Green	10	Light green
3	Cyan	11	Light cyan
4	Red	12	Light red
5	Magenta	13	Light magenta
6	Gold (brown)	14	Yellow
7	White (grey)	15	Bright white

12. It is possible to combine graphics and text in a program.

Worksheets:

1. Using the PSET statement place a red dot at coordinates (250,125) on the medium-resolution screen.

    a. First tell the computer which mode you want, followed by an instruction for color.

```
10 SCREEN -,-
```

   b. Next tell the computer which background color you want for the dot and which palette it should use. (see color charts) 20 COLOR -,-
   c. Now input the PSET statement to fulfill the assignment.
      30 PSET (-----),2

What will the 2 on this line tell the computer to do?
(Hint: Look at the color chart.)

   d. RUN your program. Compare the output to your input.
   e. Continue the program by plotting the points to output P.C. on the screen.

2. Using the LINE statement have the computer draw a magenta vertical line and a white horizontal line which intersect at (100,90).
   a. Plot your lines on graph paper or the acetate overlay first.
   b. Decide which screen mode you will need to get the assigned output.
   c. Each line must be assigned a COLOR statement.
   d. Each LINE statement must tell the computer which hue it is to print in.
   e. Write, input and RUN your program.

3. Have the computer draw a green letter L about two inches high, in the upper right hand corner of the screen. Follow the steps on worksheet II.

   Remember, the computer will draw a second line from the end of a preceding line if you do not name a new starting coordinate.

4. Have the computer draw a rectangle in high-resolution graphics where coordinates (30,80) and (140,110) are the two opposite corners of the figure.

   a. Prepare the screen for high-resolution graphics.
   b. Will you need a COLOR statement? Why?
   c. Since these lines will draw a "box", remember to follow the coordinate instructions with, B.
   d. Although your choices are limited in this mode, you must tell the computer if you want white or black lines drawn. Do that following the "box" instruction. ,B,-
   e. RUN the program.
   f. Continue the program so that the computer will draw a larger rectangle below.
   g. Now have the computer draw a third rectangle smaller than the first two.

5. Tell the computer to shade in each of the rectangles it drew for Worksheet 4.
   If you still have that program in the computer, one letter added to each LINE statement will do the trick.

6. Plan a title on your text graph to be printed on the text screen. For example:

   THIS PROGRAM IS WRITTEN BY YOUR NAME
   Have the print in red on a grey background with a green border.

Applications:

1. Keep a record of the air temperature at 9:00 A.M. for two weeks.

   Plot your results on a line graph. Instruct your computer to print the graph. Give the graph a name, label the axes and write some information you can learn from your record.

2. Poll your classmates to find the colors of their parents' cars. Put this information into bar graph form and write a program for it using colors for the bars and labeling the information with text.

Summary:

Computer graphics and text can be printed in color at assigned places on the computer screen. Graphics can be in the form of points and lines while text includes all the characters on the keyboard. The screen must be prepared and background colors assigned before the desired output is plotted according to its coordinates. The color of the graphics is assigned in the PSET or LINE statements.

TOPIC 83
TRS-80 Graphics

Aim: How Can You Make Pictures on a Computer Monitor?

Performance Objectives: Students will be able to:

- understand the structure of the computer monitor as it applies to graphics
- explain the commands used to generate computer graphics
- use the commands to create pictures and designs

Vocabulary: graphics, grid, set, reset

Motivation:

1. Choose two teams to play tic-tac-toe on the board by directing placement, according to coordinates, of the team's symbol The first team to place its symbols in a straight line is the winner.

2. Choose teams to direct, with use of coordinates, a pupil "cursor" to fill in boxes on a grid which will form an assigned shape, e.g., square, initial, realistic picture.

   The first team to complete the task is the winner.

Development:

1. Define computer graphics as pictures on a computer monitor made with the use of light and/or color.

2. Illustrate graphics on the computer by running a program which has been prepared earlier. For example:

```
 10 CLS
 20 FOR O = 1 TO 127
 30 FOR D = 1 TO 47
 40 SET(O,D)
 50 NEXT D
 60 NEXT O
 70 FOR O = 1 TO 127
 80 FOR D = 1 TO 47
 90 RESET(O,D)
100 NEXT D
110 NEXT O
120 GOTO 20
```

3. Relate the computer monitor to the grid of a graph: (See "Getting Started With TRS-80 Basic", Tandy Corp.,1981, p.339.)

   a. Teacher demonstration model
   b. Distribute students' graph paper and/or acetate overlay on the computer screen, marked with coordinates.
   c. Explain x and y coordinates.
   d. Practice locating boxes on the grid.
   e. Practice plotting on the grid.

4. Develop with the children the understanding that:
   a. The computer grid has 128 boxes across and 48 boxes down.
   b. The first box is numbered zero, therefore the boxes across are numbered 0 to 127 and the boxes down are numbered 0 to 47.

5. Each box on the grid has a name made of its place number across followed by its number down. (A mnemonic device which may be helpful is that "a comes before "d", therefore the "across" number comes before the "down" number.)

6. The computer command SET means turn a light on while the command RESET means turn a light off.

   A program such as the following can be used to illustrate the light being turned on and off:

```
10 CLS
20 A = RND(127)
30 D = RND(47)
40 SET(A,D)
50 A = RND(127)
60 D = RND(47)
70 RESET(A,D)
80 GOTO 20
```

7. The command and location must be listed one at a time in the program in this manner:

```
SET(18,4)
RESET(18,4)
```

   or the computer can be instructed to light boxes randomly along specific lines or down specific columns.

8. Use Worksheets 1 - 3 to reinforce naming of coordinates and use of SET and RESET.

9. These statements can be written in a program and combined with other statements. Use Worksheets 4 and 5.

Worksheets:

1. Begin in the immediate mode.
   Tell the computer to turn the light on and off by typing
   SET(18,4)
   RESET(18,4)

Did you see the tiny rectangle appear and disappear?

2. See if you can get the light in the middle of the screen to go on and off.

What is the location of the middle point across?
What is the location of the middle point down?
Which command means "lights on"?
Which command means "lights off"?
Type your directions into the computer.

Did you type

```
SET(64)
RESET(64,24)
```

If not, try it now.

Reverse the numbers and see what happens.

Can you explain the reason for the computer message? If not, take another look at your numbered sample of the computer grid.

3. Try the statements from number 1 again.
Now reverse these numbers.
Is the output the same? Why?

You can see how important it is to name the across line first when typing in your choice of location.

4.

```
 5 CLS
10 SET(64,24)
20 FOR T = 1 TO 300 : NEXT T
30 RESET(64,24)
40 FOR T = 1 TO 300 : NEXT T
50 GOTO 20
```

Can you see the box blink?
Which statement turns the light on?
Which statement turns the light off?

Change the time delay to make the box blink more quickly.
Now make it blink more slowly.

5.

```
 5 CLS
10 FOR A = 0 TO 127
20 SET(A,0)
30 NEXT A
```

A thick white line should have appeared across the top of the screen.
What happens to the value of the A coordinate?
What happens to the value of the D coordinate?
Add another program line to make the computer draw a line across the bottom of the screen.

Applications:

1. Create a picture on your grid by filling in columns and rows of squares.
   Write the statement and coordinates for each square.
   Type the program into the computer and RUN.

2. Write a program to illustrate a cartoon character.
   Add statement necessary to make the character move across the screen.

Summary:

Computer graphics can be executed by using commands which locate specific boxes on the screen and instruct the computer to turn those boxes of light on and off.

TOPIC 84
Commercial Software

Aim: What are the Different Kinds of Commercial Software Being Offered for Sale?

Performance Objectives: Students will be able to:

. identify different types of commercial software available
. evaluate the usefulness of these types of software
. apply the software to appropriate situations

Vocabulary: software, simulation, authoring, commercial software, data base, graphics, drill and practice, spreadsheet, tutorial, word processing

Motivation:

There are many items which can be bought in stores but which can also be made at home. Let's make a list of some of these things, e.g., bread, cake, dress, sweater, bookcase etc.

What criteria would you use to help you decide if you should buy or make the item in question? e.g., cost, quality, time involved, enjoyment etc.

With your knowledge of computer programming, you may have an option of creating software you want to use or of buying such software. To make a decision you should know what ready-made or commercial software can do. You can then apply suitable criteria to them to help you decide if you should buy such materials.

Development:

1. Assign the class to bring in advertisements for software items.

2. Categorize these items according to the descriptions accompanying them.

3. From the very many different brand name items, four or five categories should arise.

4. After eliciting descriptions for each of the categories, give the names for each:

   GAMES

   EDUCATIONAL: drill and practice, tutorials, games, simulations.

   DATA BASE

   SPREADSHEET

   TOOLS: word processing, authoring, graphics

5. Demonstrate, where possible, each type of software listed.

   a. How could this be useful at home? in school? in business? in the professions?
   b. What is the cost of the software?
   c. What skill would you need to produce this software?
   d. How much time would it take you to write this software?
   e. Is it worthwhile for you or the school to purchase this software?

Worksheet:

CATEGORY	DESCRIPTION	USE

Application:

Where possible have students use commercial software for practical purposes and compare their experience with the description written earlier.

Summary: There are several types of commercial software which can be helpful in utilizing, storing and learning information.

Projects:

1. Mount an informational campaign in the school to educate as to what kinds of commercial software are available and in what ways it can be helpful to users:

   a. Specific to administrative staff.
   b. Specific to secretarial staff.
   c. Specific to kitchen staff.
   d. Specific to custodial staff.
   e. Specific to faculty.
   f. Specific to students.

TOPIC 85
Software Development Project

Aim: How Can we Plan a Software Package Which Would be Helpful in the Teaching/Learning Situation in a Classroom in our School?

Performance Objectives: Students will be able to:

- create software according to the needs described by classroom teachers for use by students in that teacher's class
- improve software throughout the school year as programming skills are developed by the student programmmers
- improve software throughout the school year as observations by the student programmers of the student users indicate a need for changes

Vocabulary: CAI, drill and practice, tutorial, information retrieval, dialogue and inquiry, problem solving

Motivation:

Demonstrate commercial CAI software.
Discuss how this could be used in a class.

For example: Drill. Practice. Teaching.

Discuss problems this software might present:

a. Doesn't cover what was taught
b. Too easy
c. Too difficult
d. Too fast, etc.

Development:

1. Children may work in teams or individually.

2. A teacher should be identified by each group who can be approached as a willing user of the software.

3. Teacher is addressed, by letter or interview, to convey:

   a. Positive aspects of computer use in education.

   - The use of the machine motivates children to learn because they admire modern technology.
   - The use of the machine motivates children to learn because they can receive instant feedback as they think and respond to the computer output.
   - The computer can free the teacher from repetitious drill and practice tasks allowing more time for individualized personal assistance.
   - The computer can help the teacher in diagnosing and correcting individual student problems.
   - The computer program can be assigned to students individually either for remedial work or for enrichment.

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b. Subject matter criteria

. Instructional strategies: What form should the program have?

Drill and practice
Tutorial
Information retrieval
Dialogue and inquiry
Problem solving

Instructional objective: What subject matter should the program cover?

Some examples are:

States and their capitals
Recognizing correct spelling
Math facts
Shape recognition
Dictionary skills
Reading comprehension
Graph interpretation

Correlation with textbook and/or teacher's lessons:

What material should the program be based on?
Can the teacher refer the programmer to specific sources?

3. Tips to the Programmer

- As you learn to use programming statements, incorporate them in a refinement of your software. Discuss how each of the following can be used in a CAI program.

REM
PRINT
INPUT
READ/DATA
IF/THEN
GOTO
FOR/NEXT

- **Decide:**
  1. **What will be the format used?**
  2. **How many items will the program contain?**
  3. **Will the user be addressed by name?**
  4. **How will the user be told if the response is correct?**
  5. **Will a correct answer be given if the response is incorrect?**
  6. **How many chances will the user be given to get a correct answer?**
  7. **Will you give the user any hints if the answer given was incorrect?**
  8. **Will you keep score of how many correct and/or incorrect answers were given?**

Worksheets:

I. Sample letter:

P.S. 003
Borough, New York 11200
Today's date, 19--

Teacher's name
P.S. 003
Borough, New York 11200

Dear -----------,

In today's Computer Age, the classroom teacher can use the computer as a tool in helping in the school learning situation. Since children love using the computer, teachers can use it to motivate them for drill and practice, remedial work or enrichment. While certain children are working at the computer, you can have time to work individually with other students. The computer can be a real helping hand to the teacher.

As a pupil in this school who has learned to program for computers, I would like to undertake a project of designing a software package for you to use with your class.

If you would like to take advantage of my efforts, please fill out the attached questionnaire and return it to me, or tell me when it would be convenient for you to speak to me. The information you give me will make it possible to create programs specifically to fit your needs.

Thank you for your kind attention.

Sincerely yours,
Name , Class

II. Sample Questionnaire

1. Teacher's Name:
2. Class:
3. Subject of program:
4. Instructional strategy: (Check one)
   - Drill and Practice
   - Information retrieval
   - Dialogue & inquiry
   - Tutorial
   - Problem solving
   - Other
5. Instructional objective: (Please be as specific as possible in describing exactly what you would like the student to learn.)
6. From which sources would you like the material taken?
   - Textbook (name)
   - Class notes (source)
   - Other

How can I get a copy of that source?

7. Do you want the child to be given the correct answer if he is wrong?
8. Do you want the child to be given a hint if he is wrong?

9. Do you want the number of tries for the correct answer limited? If so, how many tries should be given?

10. Please add any other comments about how you want the program to run.

III. Software Evaluation:
Name of program:
Programming team:

1. Does the material fit the purpose of the program?
2. Is the information in the program correct?
3. Is the material too difficult?
   Too easy?
   Just right?
4. Is the order of the items in the program good?
5. Are the directions easy to follow?
6. Do the users have the right amount of time to put in their answers?
7. Do the children enjoy using the program?
8. Is the material interesting for the user?
9. Is the program planned to look pleasing to the user?
10. Do the children benefit from using this program?
11. Can the pupil judge his/her progress easily?
12. Can the teacher evaluate the pupil's progress easily?

Summary:

1. Students of computer programming can provide material to be used in the classrooms of the school by other students according to the needs expressed by teachers in the school.

2. There will be continuous communication between programmer and user, and programmer and teacher so that improvements in the software will be ongoing.

Appendices

APPENDIX 1

Advice to New Computer Teachers

As a novice in the computer room, you are probably not a novice to teaching. You were selected from all the other teachers on your staff because you have certain, though not necessarily computer, skills. It is imperative that you bring all of your skills into this curriculum area since, for the most part, you will be working with a minimal amount of curriculum and supplies.

You should consider this class as an extension of your subject class. If you are an ENGLISH TEACHER, you are well versed in the skills of reading and writing. Much of this course of study consists of writing in an organized fashion - be it via word processing or the programming language. Both subjects have rules to guide you through the work to the finished product.

If you are a MATH TEACHER or a SCIENCE TEACHER you probably have skills in managing a math lab or science lab. `Here, too students will go to work stations and proceed on their own, to complete an activity. As in math and science, the computer literacy course should proceed in a logical and organized manner towards a well-thought-out conclusion.

If you are a TEACHER OF ANOTHER SUBJECT, let me assure you that you too have very specific skills that are definitely needed in a computer laboratory. From the creativity of art teachers to the discussion skills of social studies teachers, your skills will be fully utilized.

PREPARATION FOR CLASS

As soon as possible, you should glance through the entire course of study, so that you can ascertain what will be expected of the students. Look especially for any worksheets that you will have to construct, or for subject material that you are not familiar with.

Speak with your colleagues about how they handled specific situations. Don't forget, they were computer novices at one time. You could profit from their mistakes and learnings.

Be sure to thoroughly learn your machine and the programs that you will be using. Failure to do this could ruin an otherwise good lesson or course.

Prepare in advance, a chart of scheduled computer use, showing each child's name, the date, and which machine he/she is assigned to. A copy of this chart should be in your marking book, because you will want to rate each student each time they use the machine.

Prepare a disk or tape for each student. This will allow each child to save his/her material, and will avoid the problem with a multi-student disk of "He ruined my program."

On the first day of class, ascertain the computer literacy level of each child. Determine who has a computer at home; a video game; a typewriter. You will soon know who is more advanced and who needs your undivided attention. Explain your long range goals and the management plan that you have decided upon.

Distribute a written set of rules for the computer room, or computer period. Go over each rule to make sure that it is understood. Assign the students to groups and make sure that they understand the schedule of computer use.

ADDITIONAL ADVICE

Depending upon the nature of the class, you will find a wide range of ability levels. Thus if you think you have a "bright" class or a "slow" class, you will be amazed at the ability levels within the class. In fact, you might find that a computer literate child in a "slow" class is far superior than the average child in a "bright" class. Have material available for three levels, whenever possible.

Some children will finish before the rest of the class. If this is happening in your situation, prepare additional activity cards that will stimulate, and keep the advanced child productively busy. For those children that need more time, it is suggested that additional time could be used before school, or if the child finishes other subjects before his/her classmates.

Don't be concerned with the fact that some children do not understand all of your initial presentations. Many children need hands-on time to comprehend what they are doing. It is suggested that after you briefly present the material, you allow the group to perform the actual lesson on the computers. Excessive drill beforehand will lead to boredom and daydreaming, i.e., the child's mind is saying "O.K. let's get on with it. I want to use the computer." You should allow enought time after the lesson to fully summarize the material.

APPENDIX 2
Advice to Experienced Computer Teachers

As an experienced computer teacher, you probably have your room set up and are familiar with the curriculum. Therefore, it is your goal to expand your equipment, curriculum and knowledge. In addition, if there are novice computer teachers in your school, it behooves you to assist them with their needs.

EXPANDING YOUR EQUIPMENT

You should try to obtain the maximum number of machines for your room. Constantly work with the administration on ways to secure more equipment and material. You should also work with the Parents Association and local merchants to obtain material and equipment. Establish a working relationship with your local computer dealer or distirbutor, so that you might obtain better prices and service than if you went elsewhere.

Since you are already familiar with the equipment, you should subscribe to specific journals and magazines that would keep you abreast of what is new for your machine. By knowing about networking, for example, you might save many hundreds of dollars, and you might thus expand the amount of machines in your room. On the other hand, if the network fails, will you have enough backup capacity to carry on a lesson.

KNOW YOUR CURRICULUM

As with everything else, a curriculum is not a static document that never changes. A good curriculum is written to easily incorporate the latest state-of-the-art technology. After teaching the curriculum for a year, you should know its strengths and weaknesses. Communicate the weaknesses to the authors, while trying to improve on them. Emphasize the strengths of the curriculum, while trying to improve on them.

Search for, and obtain, suitable text books or other written material to enhance the curriculum. Lacking this you should develop your own reading lessons and work sheets that will incorporate your style of teaching and at the same time present the material in this manual.

INCREASE YOUR KNOWLEDGE

As an experienced educator, you should constantly strive to increase your knowledge of your subject matter. There are many excellent courses taught by the Board of Education that will do just this. For example, there are advanced courses; graphics courses, word processing and data base courses.

Local colleges offer courses in computer languages. If you don't already know Logo or BASIC, this is for you.

Join a computer club. This will give a place to obtain the answers to a multitude of questions about machines, programs and general knowledge. You will also meet other educators who have problems similar to yours. In this atmosphere, you will be able to compare problems and seek out solutions to them.

APPENDIX 3
Classroom Organization

PLACEMENT OF EQUIPMENT

Though micro-computers have been around for about decade, your school probably has very few of these machines. Thus you must take advantage and maximize whatever equipment you have. If you have very few machines, you should obtain a large 25-inch monitor, so that all of the students in the class could observe the material. This should be securly mounted to a portable table, at a height above head level. Students should be called up to one of the computers, one at a time, to demonstrate a particular skill or command. The rest of the class should follow along on the worksheets that you provide for them. Don't forget to give each student a chance for hands-on experience. This situation allows you to have total control over the machine, students and classroom.

If you have two to four computers, I would not advise dividing the class into two to four groups. If you have 28 students in the class, groups of 7 to 14 students are too large. Obtain individual work stations for each microcomputer, or large enough desks to accomodate the group that will be using the machine.

Eight computers in the room, will allow you to divide the class into two groups. Half will be working at their desks and half will be working on the computers. Those on the computers, will be working in pairs.

Fifteen or more computers will allow you to have all of the students in the class work in pairs on the computers. This is the best situation for the class, though you must constantly be moving around the room to assist all of the fifteen work stations.

In all cases, the individual work stations should be separated from the others in such a manner so that the students at one monitor will not be able to view the other monitors. This could be achieved through the use of cardboard or plywood dividers. The purpose of this is to focus the student's attention on his/her own work and to avoid the distraction of the other machines.

ELECTRICAL NEEDS

A standard outlet is protected by a fifteen ampere circuit breaker. This is more than adequate for fifteen micro-computers and their television monitors. If you are lucky enough to have more than fifteen units, or have several printers, it is advisable to utilize outlets that have twenty ampere circuit breakers or are on separate lines. Check with the schools custodian about this matter.

When using many computers with a single outlet, always use extension cords that are grounded. In addition, it is advisable to use power strips that have their own circuit breakers in them, and have at least four sockets. Never plug many computers into one outlet using multiple expansion plugs.

When a full room of computers is available, you should provide adequate heat removal via fans or air conditioning. Excessive room heat will cause program failure due to overheating of the computer hardware.

SAFETY

In the placement of all furniture, it is important to always leave aisle space so that all machines are accessable at all times.

All wires must be placed in such a manner so as to avoid accidents. Use the shortest wires that are feasible and avoid using long wires whose excess length will have to be coiled up and tied. Let the wires hang loose and out of the way. This will prevent excessive heat build-up.

Run long extension cords in such a manner so that they will not be in aisles or in places where the students could trip over them.

With many computers in use, it is advisible to have a fire extinguisher in the room that is rated for electrical fires.

PROGRAMS AND MATERIALS

Each student should have his/her own folder. The folder should contain a pocket on the inside front cover for the students disk. The front of the folder should contain a sheet that has the following information.

Student's Name________________ Class_________

Date	What did I do today?	Mark

This would allow the teacher to immediately know where a child is up to and how well he/she is doing.

Space should be allocated in the room to contain such materials as (1) activity cards, (2) computer magazines, (3) programs to be typed in and (4) displays of computer materials. The latter could include such things as computer chips, disks that have been taken apart, commercial programs or other interesting material.

A chalk board should not be used when the computers are being used. The dust given off, even by dustless chalk, will eventually damage both the machines and the computer disks. It is advisable to use overhead projectors whenever possible. Lacking this you could use large sheets of lined paper. If the computers are stored in your "non-computer room", you should keep them covered when not in use. This would keep the machines as dust free as possible.

APPENDIX 4
Classroom Management

Classroom management and classroom organization go hand in glove. If the computer classroom is not well organized, it is difficult to present a well-managed lesson.

A well-managed lesson is conducted in such a manner so as to arrive at a conclusion through a series of carefully planned steps. It is hoped that this curriculum guide is laid out in such a manner so as to provide the skeleton of the lessons needed to achieve this.

While there is no set amount of time for a computer lesson, it is suggested that a block of forty minutes to an hour be set aside for this when done as a class activity. When individual students are given computer time, the minimum block of time should be fifteen minutes.

The day's lesson should begin with the Aim displayed in such a manner so that all could see it. As was noted elsewhere, try to avoid the use of chalk in the room with computers. The chalk dust could cause problems with the programs and the machines.

The aim, like those in this guide, should be in question form. The whole purpose of this aim is to provide direction for the day's activity, and will, at the end of the lesson, be used as a summary question to wrap up the day's work. Start the lesson by having a student read the aim so that the class will know in what direction they are headed. At this time, start the day's Vocabulary. Write down any new word found in the aim, along with its elicited definition.

Every lesson needs Motivation. You motivate the class through questions that are thought-provoking, demonstrations that are awe-inspiring or through an activity that is an enjoyable learning experience. It is through the motivational process at the start of the lesson that you fire your "big guns" to get the student's attention. If you do not have their attention, all that you do after this period of time will be wasted.

From here on, a well-managed classroom would split into several different activities at the same time. For example, some students will work on the computer, other students might be figuring out a programming problem, while still other students are reading a book pertaining to computers.

The skillful teacher is like a juggler in a circus - when all the hoops are in the air, and going around smoothly, there is no problem. The whole trick is to keep all the rings going smoothly. In a classroom, the teacher must make sure that all of the different activities are running smoothly. This CANNOT BE DONE when the teacher is sitting at a desk. The only time a teacher should be constantly at the main desk is when there is a room full of computers and they are networked. When this is in place, the teacher can take control of any computer in the classroom, and provide immediate guidance and on-screen help to the student. Lacking this network, the teacher should be in constant motion, traveling from activity to activity, like a peddler going from town to town, peddling his wares.

Too many good lessons are ruined when a teacher has the class spend fifteen minutes copying notes from the chalkboard. Notes should be a brief summary of what just transpired. If more written work is needed, then the teacher should provide a worksheet for each child.

A Worksheet can take many forms, but if it is to be kept by the student, then there should be a place printed on the top for the child's name and the date. In addition, as noted in the last section, a child should have a folder in which to keep these worksheets.

Many worksheets have been provided in this curriculum guide for you to copy, while others are printed by book publishers and are specifically labeled "for class distribution." Other worksheets can be purchased as either dittos or ditto master line drawings. The best and most useful worksheets are those created by the teacher. These worksheets reflect the teacher's philosophy of teaching, use the language and vocabulary that the class is used to, have a unique style that the class can follow, and are often highly motivating to THEIR class.

The secrets of making a good worksheet are:

- Avoid crowding all that you can onto one sheet of paper.
- Keep it simple. Present only one or two concepts on each sheet.
- Keep it light and enjoyable. Use cartoon characters or simple drawings that are pleasing to look at.
- Neatness counts. If the worksheet can't be read, it is useless.
- Provide a heading which includes room for the student's name, date and title of the sheet.
- Leave enough room for the students to fill in the answers. If they are going to write sentences, be sure to leave several lines for this.
- Underline, circle or use bold letters for all of the key vocabulary words that you want to stress.
- Reproduce the ditto in color, or allow room for the students to color in part of the work.
- Always try to include work on the worksheet for all levels within the class. Thus you should include a challenge problem for the more advanced students.
- Be sure to mark the worksheet after the students have completed it.

Like a worksheet, a lesson must also provide for all students. We have included in this curriculum guide Activities and Projects on several different levels, with each topic. As you go through this material, remember that both short range and long range goals should be met.

At the end of every lesson, you should present a Summary of what was taught that day. In this curriculum we have provided several examples of summary questions at the end of each topic.

APPENDIX 5
Security

When we talk about security, we are really talking about many things;

1. Security of the area
2. Security of the equipment
3. Security of the software
4. Security of personal data

All of these areas are to be given a high priority when you are planning or organizing the computer program.

1. Security of the area.

When planning the computer room, you should consider an area that is not easily accessible from the street level. A room on the third floor of the building is much preferred to a sub-street-level room.

Once the room is selected you MUST provide at least the following minimum amount of protection.

1. The door should have a fox lock to be used whenever the school is closed.
2. You should not be able to open the regular lock with a master key.
3. Window locks should be in working order.
4. The walls should be solid masonry and not wallboards on studs.

Only a minimal number of keys to the computer room should be distributed. Only the teacher who is using the room, the supervisor and the custodian should have a set of keys. This set of keys should not be left on the rack of school keys overnight, nor should they be taken home. These keys should be secured in a safe place overnight.

In addition to the above, the room should be wired with an intrusion alarm. The area "sound" type is superior to separate contacts on the doors and windows.

2. Security of the equipment

It is the policy of the New York City Board of Education, to mark and identify all of its capital equipment. Included in the contract price for all computers, is the requirement that each computer be engraved with "N.Y.C. Board of Ed." If your machines do not have this engraved on them, you should have this done immediately.

In addition to the CPU you should also engrave the disk drives, modems, and the printers. While many computers have additional devices, these should not be engraved due to possible damage.

Such items as graphics tablets, drawing pads, light pens, joysticks, paddles and peripheral cards should be marked with special marker pens whose ink is waterproof and highly resistant to removal.

All cables and wires should be marked as to which machine they belong. This could be done with wrap-around tags.

In addition to the above, you must have a proper inventory card on file for EACH piece of equipment. This card should not only contain a physical description of the item, but also its serial number, manufacturer, date of purchase, physical location and other pertinent electrical and physical information. See the special Board of Education Circular pertaining to the inventory procedures.

Once the equipment is marked, identified and placed in a secured location, the equipment is reasonably protected from theft. If your budget allows for additional safety features, you could purchase individual locks for the machines and disk drives. These usually cost more than $100 per machine.

3. Security of the software.

The second biggest expense in the computer room is the software, yet it is the first piece of equipment to disappear.

Each piece of software should be clearly identified with the school name and address. The manuals can easily be stamped with black ink while the individual disks can be stamped with waterproof white ink.

One teacher should be responsible for all of the software, and should have an inventory card made out for each individual package. When other teachers or students want to borrow the package, they must sign out for it. When not in use, these programs should be kept in a locked, secure cabinet.

4. Security of personal data

There are two areas of concern here; (1) student records and (2) student programs. The former contains the student's reading scores, Osis I.D. number, address, telephone number, etc., while the latter contains material that the student created.

Both of these disks can be protected through the use of passwords. The more sophisticated data base programs allow you to assign a password or two so that various personnel will have access only to parts of the program - e.g., read only, read and write, change the password. Student program disks could be initialized in such a way that the students would have to enter either their code or their password to gain access to their files. As the group becomes more and more sophisticated, the procedure for creating this protection also will have to increase.

Whenever you have important records or data, you should keep a back-up copy of this material. All data disks should be kept under lock and key, but the back-up disks should be kept in a different area of the room...or better yet...in a different room.

Like the other software programs discussed above, these data disk should also be signed out for.

Remember - If you want to use it tomorrow, lock it up tonight.

APPENDIX 6
Computers in Special Education

Special educators must prepare students to live in a time when many aspects of community life will be computer-dependent. Daily living skills, such as banking, using the library, and shopping, are rapidly undergoing computerization. Skills taught only a few years ago are, in some cases, already obsolete. Special educators face the challenge of preparing their students to live in a world in which computer literacy may well prove to be as important as book literacy.

Our present special education program attempts to serve students with a wide range of intellectual, motor and communications skills. In recent years there have been tremendous advances in the range and sophistication of adaptive devices to be used with microcomputers. Such devices aid those with special needs in their use of computers.

For the blind, there are Braille keyboards, Braille printers, and programs that convert Braille to English and vice versa. The visually impaired can make use of a device that enlarges the on-screen letters up to sixteen times their normal size.

Software is now available which helps teach lip-reading through animated graphics. Another program depicts the pitch and frequency of the teacher and speech student's voices side by side, and learning can take place using a very accurate feedback method.

A number of control devices have been developed for the physically disabled. These devices allow even with only one physical control site to interface with the microcomputer. The user with good head control can use an optical headpointer; a manual pointer can be utilized by someone with fine motor skills; those with more erratic control can use a wobble switch; for quadriplegics with speech ability, there are voice-activated systems.

By maneuvering one switch in any of the above fashions, the user can perform quite sophisticated functions. It is becoming possible to operate the computer with more subtle body cues. Handicapped students who were formerly excluded from the mainstream of education may no longer face obstructions to learning.

There are a great number of ways in which the microcomputer can be utilized in the special education classroom. The computer can be utilized as a type of "electronic blackboard." The teacher inputs data which could be viewed by the entire class on a large monitor. The teacher might also call individual students to input a line of data while the rest of the class looks on. In this way, the computer is utilized as a tool for class participation.

This type of lesson would best be followed by a reinforcement in which students went to separate terminals. The smaller class size of most special education classes makes this economically feasible.

There are several important reasons why a computer curriculum should be utilized by special education. The computer allows students to make errors in a non-threatening way. It has infinite patience (if so programmed) and is non-judgmental in its feedback. This form of non-threatening feedback may help decrease the great amount of stress which is so evident in many of our special education classrooms. Some research indicates that many learning-disabled students show a decline in impulsive behavior while working at the computer and a concomitant decline of impulsive behavior in other learning activities.

Many of our special education students have limited success with paper and pen activities. The highly motivating and non-threatening aspects of the computer may allow us to reach a few new students. The individualized nature of computer instruction will allow the teacher to spend a greater amount of time working with students on a one-to-one basis. At the same time, individualized software assures that each student at a terminal is receiving relevant work and immediate feedback to his/her input. Careful selection of software packages will assure that the needs of both the fast and slow learner are met. The computer will allow each child to work at his/her own pace.

Many special education students display a greater need for repetition and routine than their regular classroom counterparts. Drill and practice, which are often tedious, can be made more exciting through the use of animation, sound effects and game-playing situations. Thus, the need of many of our students for "overlearning" can be met without the usual dread.

Finally, the problem-solving aspects of computer programming allows special students to move out of the role of passive learner into the role of active problem solver.

The educational potential for the computer in the classroom is great, but there are some problems which educators have to deal with. Most computer assisted instruction is transmitted visually. Special education students with reading problems may have difficulty following the written instructions. Therefore, teachers should be circulating around the room and reinforcing the visual cues with verbal directions.

Another potential problem is that a computer-delivered tutorial system, may, by gaining in ability to individualize instruction, lose in teaching social interpersonal skills. Many special educational students have a need to develop more positive social skills. Will the computer kill the change to develop these skills in the classroom? Again, the teacher can make a big difference here. By adding human reinforcement in the form of praise or an approving touch, we can keep the student from becoming too isolated. Teachers may want to allow two or more students to work together on a particular program. This should not be offered as a rationale for having more students per computer.

The wide variety of learning styles and individual needs among our special population calls for one child per computer wherever possible. Since the special education class is usually smaller in size than the mainstream class, this is generally not a problem.

A third potential problem is the possibility of using the computer to instruct in areas that could best be presented in another medium. One should not try to teach skills which are best presented auditorily with a computer which relies so heavily on visual material. Advances in the development of the talking computer and other technological innovations will allow teachers to utilize computers in teaching to a student's strongest modality.

Yet another area of concern is the possible use of the computer as an "electronic babysitter." There are many arcade-type games available for use with micros. While these games can serve as reinforcers in certain instances, one must be careful not to overuse them.

Finally, it seems that the technological innovations in computer hardware have outdistanced the development of appropriate software in the special education field. There is a great challenge for special education teachers to develop software which will serve not only as electronic textbooks but will maximize their students' potential.

In general, software systems designed for special education should have the following characteristics:

1. Diagnostic and prescriptive strategies which will place the user at the correct level.

2. It should be organized into a hierarchy of skills.

3. It should have clear performance objectives which are measureable.

4. It should be individualized and provide immediate feedback to user responses.

5. It should utilize a multi-sensory approach.

Teachers who have little experience in programming can still be of great help in developing good computer instruction programs. First, it is important for them to preview hardware that is going to be purchased by their schools. Will it meet the needs of the special students in their classrooms? Furthermore, teachers need to review and constructively criticize computer software in much the same way they evaluate other curricular material.

APPENDIX 7
Software Duplication Guidelines

Like plays, novels, songs, textbooks, and all other published material, the programs and files on a published computer diskette are fully protected by the copyright laws of the United States. No diskette can legally be copied without the appropriate permission of the publisher. The position of the Office of Technology of the New York City Board of Education on diskette copying is clearly stated in the June, 1986 issue of COMPUTALK:

1. Duplication of copyrighted software or documentation is prohibited.
2. Software publishers must be contacted to verify procedure for backup multiple copies and licensing agreements.
3. A publisher's written permission is required to download or network programs to other microcomputers.
4. No student or Board of Education employee may use school computers to duplicate copyrighted software.
5. The use of illegally duplicated software, however obtained, is prohibited in all Board of Education facilities.
6. Simultaneous use of original software and/or its back-up is not permitted without the written permission of the publisher.

Although the New York City Board of Education does not have computer diskettes under contract at this time, New York City schools can order diskettes through companies that have been awarded New York State contracts. If you wish to purchase additional diskettes, the Office of Technology suggests that you contact

Kilobytes Incorporated
80 Davids Drive
Hauppauge, N.Y. 11788
(516) 231-1800
contract number P23590

The item number for flexible diskettes size 5 1/4 inches is MD00505. The description is 1 sector (soft sector), and the price is $5.50 per box of ten.

APPENDIX 8
Copying Diskettes for the Apple IIe and Apple II Plus

To make a copy of your software diskette, follow these steps:

1. Before proceeding, be sure that the diskette you wish to copy is write protected. Write protecting your diskette will prevent you from accidentally erasing or overwriting any of its programs or files during this or any other use of the diskette. You can write protect a diskette by placing a small piece of tape over the write protect notch on the diskette's left side.

2. Insert the DOS 3.3 System Master diskette into drive 1 and turn the computer and the monitor on. When the Applesoft prompt and cursor appear type in RUN COPYA and press RETURN.

3. The screen will display the message

```
APPLE DISKETTE DUPLICATION PROGRAM
ORIGINAL SLOT:   DEFAULT = 6
```

   Press RETURN.

4. The screen will display

```
ORIGINAL SLOT: 6
       DRIVE:    DEFAULT = 1
```

   Again, press RETURN.

5. The screen will display

```
       DRIVE: 1
```

   and add a new message:

```
DUPLICATE SLOT:  DEFAULT = 6
```

   Press RETURN.

6. The screen will display

```
DUPLICATE SLOT: 6
```

   and ask one last question:

```
       DRIVE:    DEFAULT = 2
```

   If you are using an Apple II Plus or IIe with one disk drive, change the number 2 to 1 and press RETURN. If your machine has two disk drives, simply press RETURN. The screen will display

```
-- Press 'RETURN' key to Begin Copy --
```

7A. If you are using a computer with two disk drives, the screen will give you no further instructions. Remove the DOS 3.3 System Master diskette and insert the source diskette into drive 1. (The source diskette is the diskette you want to copy.) Insert the target diskette into drive 2.

(NOTE: It is not necessary to format a new diskette before using it as the target diskette. The Apple II Plus or IIe will format it automatically before copying onto it.)

Press RETURN. Reading and Writing messages will appear alternately as the computer reads the source diskette and writes onto the target diskette. If the target diskette has not been formatted before, the screen will also display Formatting.

7B. If you are using a computer with a single disk drive, press the RETURN key. You will have to alternately insert and remove both the source diskette and the target diskette during the copying procedure. The screen will tell you what to do at the proper times. Follow its instructions carefully. When you insert the target diskette for the first time, the screen will display the word Initializing while it proceeds.

When the screen displays the message

```
DO YOU WISH TO MAKE ANOTHER COPY?
```

the procedure is over; the target diskette has been made into a duplicate of the source diskette.

8. If you want to make another copy of the source diskette, type in Y and press RETURN. The screen will repeat the message

```
-- Press 'RETURN' key to Begin Copy --
```

You can repeat this procedure as many times as necessary and make as many copies of your original data or public domain program diskettes as you need. When you no longer wish to make additional copies, press N and remove the source diskette from drive A.

APPENDIX 9
Copying Diskettes for the IBM/Tandy

Diskcopy with One Disk Drive

To make a copy of a software diskette on an IBM PC, PCjr, or IBM compatible Tandy computer with a single disk drive, follow these steps:

1. Before you start, be sure that the diskette you wish to copy is write protected. Write protecting a diskette will prevent you from accidentally erasing or overwriting any of its programs or files. You can write protect a diskette by placing a small piece of tape over the write protect notch on its left side.

2. Insert the IBM DOS diskette into the disk drive, turn the computer and the monitor on, wait for the DOS to boot up, then enter the date and time. The last line on the screen will be A>.

3. Type Diskcopy, then press ENTER. The screen will display the message,

```
Insert SOURCE Diskette in Drive A :
Press any key when ready . . .
```

   The SOURCE diskette is the diskette you want to copy. Remove the DOS diskette from the disk drive and insert the Source diskette. Press ENTER.

4. The screen will display a Copying . . . message, then the following instructions:

```
Insert TARGET Diskette in Drive A :
Press any key when ready . . .
```

   The TARGET diskette is the diskette you want to copy to. Remove the source diskette from the disk drive and insert the Target diskette. (NOTE: It is not necessary to format a new diskette before using it as the target diskette. Diskcopy will format automatically before copying.) Press ENTER.

5. If your target diskette has not been formatted before, the screen will display a Formatting . . . message before it copies. After it has formatted and copied, it will repeat the message it gave you in step 4:

```
Insert SOURCE Diskette in Drive A :
Press any key when ready . . .
```

   Remove the target diskette from the disk drive and insert the source diskette again. Press ENTER.

6. After another Copying . . . message, the screen will repeat the message from step 5:

```
Insert TARGET Diskette in Drive A :
Press any key when ready . . .
```

Again, remove the source diskette from the disk drive and insert the target diskette. Press ENTER.

7. This is the last stage of the procedure. When the screen displays the message

```
Copy another diskette (Y/N)?
```

the procedure is over; the target diskette has been made into a duplicate of the source diskette.

8. If you want to make another copy of the source diskette, type in Y. The screen will repeat the message

```
Insert SOURCE Diskette in Drive A :
Press any key when ready . . .
```

You can repeat this procedure as many times as necessary and make as many copies of your original diskettes as you need for use in the New York City Public Schools. When you no longer wish to make additional copies, press N and remove the source diskette from drive A.

Diskcopy with Two Disk Drives

Copying on an IBM PC or IBM compatible Tandy with two disk drives is an even easier procedure, because it doesn't require alternately removing and inserting the source and target diskettes. Follow the directions for steps 1 and 2 for a computer with one disk drive, then type in Diskcopy A: B: at step 3 and press ENTER. The screen will display this message:

```
Insert SOURCE Diskette in Drive A :
Insert TARGET Diskette in Drive B :
Press any key when ready . . .
```

Remove the DOS diskette, insert the source and target diskettes into the proper disk drives and press any key on the typewriter keyboard. The screen will display a copying . . . message while it copies the source diskette and a formatting . . . message if the target diskette hasn't already been formatted. When the screen displays the message

```
Copy another diskette (Y/N)?
```

the procedure is over; the target diskette has been made into a duplicate of the source diskette. If you want to make another copy of the source diskette, type in Y and repeat the procedure.

NOTE: To prevent students from accidentally erasing the new diskettes, write protect each of them before using them with a class.

APPENDIX 10
Caring for Your Diskettes

Your computer diskettes will provide years of dependable service if you and your students handle them properly by following a few simple procedures.

1. Never handle a diskette unnecessarily. When it is necessary to touch a diskette, hold it by the corner near the label, and touch as little of its surface as possible. Under no circumstances should you ever touch the interior magnetic recording surface, either through the center of the diskette or any other opening in the diskette cover.

2. Never bend or fold a diskette.

3. Whenever possible, write out the diskette label before affixing it to the diskette. If it is necessary to write on the label after it has been affixed to the diskette, always use a felt tipped pen or marker. Never write on the diskette with a pencil or ball point pen.

4. Never attach anything to a diskette with a paper clip of any kind.

5. When a diskette is not in use, always return it to its paper envelope. Store it in a cool, safe place, away from direct sunlight, excessive heat, moisture, dust, and dirt of any kind.

6. Computer diskettes are magnetic, and any contact with other sources of magnetism can destroy the programs and files that are stored on them. Keep your diskettes away from magnets of any kind, no matter how harmless they seem to be. Magnetic desktop paper clip holders (a principal source of trouble because they aren't obvious), magnetic children's toys and so forth can damage your diskettes no matter how harmless they appear to be.
   In addition, many common electric and electronic appliances are sources of magnetism. Televisions, radios, electric lights, and even the screen of your computer monitor produce minute amounts of magnetism which can cause diskette damage. Store your diskettes away from these devices when they are not in use, and do not allow your diskettes to come into contact with them when you are using them.

7. Never attempt to clean a diskette with cloth or fluid.

8. Always write protect your important diskettes by covering the notch in the left side with tape. This will keep you from accidentally erasing or overwriting an existing program or file.

9. Finally, accidents that ruin or erase diskettes are bound to happen. Learn how to use the diskcopy and copy commands on your DOS, and, as a precaution, always make backup copies of any diskettes you would find difficult or impossible to replace.

APPENDIX 11
Glossary of Computing Terms

abacus	A device used to aid in arithmetical calculations. It consists of a counting frame with parallel wires or rods on which sliding balls or beads are moved.
access	To get; to access a record is to get a record.
acoustical coupler	A modem that connects a computer terminal to a telephone handset or receiver and changes computer signals to signals that can be sent over a phone line. (see modem)
address	A number for a location in the computer's memory. When programming a computer, an address is given to each piece of information and to each instruction. In the problem 2 + 3 = the 2 and 3 have addresses at which they are located. The answer will have its own address and so will the instruction that tells the computer to add these numbers.
Aiken, Howard	The man who developed the Mark I mechanical computer. It was also known as ASCC (Automatic Sequence Controlled Calculator); one of many pioneers of modern computer design.
algorithm	A procedure for solving a problem or making a decision.
application programmer	A programmer who learns how programs will be used (that is, the application) so that the programs he or she writes will work well.
analog computer	A computer that works with a continuous scale or measure as opposed to the digital computer, which works with a scale or measure with distinct values. A watch that uses hands to tell time is an analog watch. A digital watch shows the time with numbers only.
Atanasoff, John V.	An early pioneer in computing who, with Clifford Berry, experimented with the first electronic computer (the Atanasoff-Berry computer), which used vacuum tubes.
Babbage, Charles	A British mathematician who designed a calculating machine called the Analytical Engine.
batch processing	Gathering information and entering it into a computer all at once as opposed to entering it continuously. Order forms and bills are often batch processed.
BASIC	(Beginner's All Purpose Symbolic Instructional Code) A programming language for beginning programmers.
benchmark run	A test run of a program used to judge its performance. It may be measured against a different program, or against its own performance on another type of computer.

Berry, Clifford	The man who, with Atanasoff, experimented with the first electronic computer.
binary number system	A number system using 0 and 1 to represent all numbers. For example: 2 in the decimal system is 10 in the binary system; 3 is 11 in the binary system.
bit	A short way of saying binary digit, the smallest unit of information a computer processes. A bit is either a 1 or a 0, one of which means current is flowing in the circuit and the other means it is not.
branch	To select one of several possible sets of instructions in the execution of a computer program. For example, the computer may follow one set of directions if a number is greater than 5 and another set of directions if a number is less than 5.
bubble memory	A solid state device that uses tiny bubbles or magnetized areas to store information; a type of secondary storage device.
bug	A programming term for an error or mistake.
byte	A number of bits processed as a unit and usually shorter than a computer word. A byte is often 8 bits long.
card punch	A device that punches holes in a card to represent data.
card reader	An input device that senses hole patterns in a punched card and changes them into computer data.
central processing unit	(CPU) The part of the computer that interprets instructions and carries them out; the core of the computer.
character	A letter, digit, or other symbol that is used to represent data. All symbols that appear on a computer keyboard are characters. A space is also a character.
chip	A common name for a small bit of silicon upon which an integrated circuit is built. A chip is about one-half the size of your smallest fingernail.
COBOL	(Common Business Oriented Language). A standardized language developed for business use.
coding	A way of shortening data so it will take fewer characters or memory locations. This is done by using a single number, the coded value, to represent a range of original values. For instance, the ages 1 year through 5 years may all be represented by the number 1.

compiler	A program that changes a computer program written in another language, such as FORTRAN or COBOL, into machine languge.
(electronic) computer	A machine that stores and processes information using electrical and magnetic signals.
computer science	The study of theories of computation. Computer scientists develop languages and ways of putting data into the computer, among other things.
conditional structures	Instructions that test the values of variables and change the execution of a program accordingly. For example, a program may say if the result (or branch) is greater than 5, go to location 16; if it is less than 5 go to location 17.
controller	A device that moves information between a disk or tape and the main memory so the CPU can use it.
control structure	A set of instructions and a statement that tells how many times or when the set of instructions is to be executed.
data	The information that is put into a computer to be processed by a program or that results from the execution of a program.
data flowchart	A flowchart that shows the path of data in the solving of a problem, and which also notes the phases of processing.
data processing	Taking information and changing it into other useful forms. Data processing may include calculation and information storage, among other things, to produce the desired results.
decimals	A system of numbers using a base of 10 so that all numbers are represented by combinations of the numerals 0 through 9.
digit	Any one of the 10 Arabic numerals 0 through 9.
digital computer	A computer that works with a scale or measure with distinct values as opposed to the analog computer, which works with a continuous scale or measure. A digital watch shows the time with numbers only. An analog watch is one with hands.
direct access files	(Also called random access files) Files from which records may be taken in any order as opposed to sequential files, in which a record may be found only by going through each preceding record in order.
disk	A flat, circular plate (usually the size of a long playing phonograph record) with a magnetizable surface layer upon which data can be stored by magnetic recording; a secondary storage device.

diskette	A secondary storage device (about the size and shape of a 45 RPM record) with a magnetic surface for recording.
disk drive	A device that plays and records disks or diskettes.
direct connect modem	A modem that connects directly to the phone line and changes computer signals to signals that can be sent over a telephone line.
Ecker, J. Presper	The man who developed the ENIAC, a first generation computer, with John W. Mauchly.
execute	To perform or carry out, as to execute (or run) a computer program.
execution or run-time	An error that can only be found by executing or running the program.
feedback	The use of part of the output of a machine or system as input to make it self-correcting.
file	A set of related records stored together and treated as a unit. For example, a file may contain all the payroll records for a department of a company.
field	A certain area of a record used for a particular piece of data such as age or name, for example.
field test	The testing of a computer program on a very small scale so errors or problems may be found and changed before the program is used widely.
first generation computer	A computer that uses vacuum tubes, like the Atanasoff-Berry computer, the ENIAC, and the UNIVAC.
finite	Having a definite beginning and an end.
flowchart	A graphic representation (or picture) of an algorithm using symbols to show the steps.
FORTRAN	(FORmula TRANslation) A computer language used mostly by scientists.
graphic digitizer	A graphic input device that changes lines or pictures on paper into coordinates that are automatically fed into the computer.
graphic tablet	A kind of graphic digitizer made up of a pen or stylus used to trace on an electronic board or "tablet."
graphic terminal	A terminal that shows graphic information on a tv-like screen. It may show bar graphs or maps, for example.

hardware	The physical equipment of a computer (as opposed to software).
hardware designer	Electronics engineer who designs the physical equipment of computers.
hard copy	A printed copy of computer output in a readable form, such as listings or reports.
Hollerith, Herman	The man who developed a punched card system for the census. This punched card system was revolutionary. It enabled people to store and retrieve large amounts of information.
Hollerith card	A punched card designed by Herman Hollerith to store information; used today by computers.
information	Organized data used in a computer program.
instruction	In a programming language, a command that names one operation and identifies its operands.
information error	A mistake in a program caused by a mistake in the data given the computer.
input	Information given to the computer, or program results that are recycled as information to be further processed; to input information is to put it into the computer.
input/output devices	Devices that move data into or out of the main memory of a computer.
integrated circuit	A small chip of silicon that performs the same functions as many transistors, capacitors, and resistors on a circuit board.
Jacquard, Joseph Marie	The man who used punched cards to control looms. This was the first automated machine.
Josephson circuit	A new type of circuit, which may increase the speed of computers as much as 100 times.
jump	A change in the usual order in which instructions are followed; a branch. For example, a computer may follow one set of instructions if a number is greater than 5 and another set of instructions if the number is less than 5.
key	The portion of a record used to determine where a record goes in a file.
kilobyte	1024 bytes of information. The memory capacity of a computer is often indicated in terms of how many kilobytes it can store.

language	A set of words and other symbols used to give instructions to a computer. Each computer language has its own structure.
Leibnitz, Gottfried Wilhelm von	The man who created an early multiplying and dividing machine. This was a great improvement on Pascal's adder and dramatically increased the speed at which calculations could be made.
light pen	A graphic input device that is light-sensitive. When the light pen touches the display (or tv) screen, the computer can sense the position of the pen.
line printer	A device that prints a line of characters as a unit, as opposed to printing one letter or character at a time as a typewriter does.
loop	A set of instructions that may be executed repeatedly while a certain condition exists. For instance, as long as a certain number in the program remains under 5, the program keeps repeating the same steps.
Lovelace, Ada Augusta	Countess Lovelace, the daughter of the poet Lord Byron, saved Babbage's ideas by writing about them in everyday language.
machine language	The only language understood directly by a computer. Machine languages are composed of binary numbers. Each type of computer has its own machine language.
main memory	(Sometimes called core memory). The internal storage device of the computer.
Mauchly, John W.	The man who developed ENIAC, a first generation computer, with Eckert.
mechanical plotter	A graphic output device that uses pen and ink to draw lines on paper.
megabyte	1,048,576 bytes of information, often used to note the size of memory.
menu	A menu in a computer program is similar to the table of contents in a book; it tells what the program includes.
microcomputer	A computer that has a microprocessor as its central processing unit.
microprocessor	A tiny silicon chip that is the central processing unit of a computer.
minicomputer	Computers that range in size from the size of a desk to the size of a phone booth. Minicomputers are often used with a variety of input and output devices to enable them to serve very specific purposes. They are very flexible.

modem	Short for modulator/demodulator; changes computer signals (digital data) into tones that can be carried on telephone lines. It also changes computer signals that come over the phone as tones back into digital data to be entered in a computer.
multiplier	The numeral that tells how many times a step is repeated.
Neumann, John von	The man who proposed that computers use the binary number system and stored programs. The use of these two ideas changed the direction of computer design and greatly speeded its development.
on-line	A terminal connected to a computer at which a person may enter data continuously. Some on-line terminals are connected to a computer via a telephone and are only linked in when there is information to be processed.
operand	A piece of data from the computer's memory to be used by a machine language instruction.
operating systems	A program that controls the execution of computer programs.
operation	One of the basic functions a computer can perform such as addition, subtraction, and movement of data.
operation code	The portion of a machine language that tells the computer what operation to perform as opposed to where to get the data.
operations personnel	Personnel who are directly responsible for making sure the computer is usable and operating properly.
operational	Able to be used; an operational algorithm is one that tells exactly what to do at each step and is therefore usable.
output	The information, or results generated by a computer during the running of a program.
Pascal, Blaise	The man who created an early adding and subtracting machine. This machine was the first step in the development of computers.
personal computer	(Also called microcomputer). A tabletop computer that has a microprocessor as its central processing unit.
peripheral devices	External devices that can extend a computer's capabilities. These include input/output and secondary storage devices.
plotter	An output device that presents information in a graphic form by drawing mechanically with pen and ink on paper.

power	The speed and storage capacity of a computer. The greater the speed and storage capacity of a computer, the greater its power.
process	A systematic order of operation followed to produce a certain result. When a computer adds or otherwise performs operations on numbers, it is processing the numbers.
program	(n) The instructions that tell the computer what to do; (v) to write the instructions that tell the computer what to do.
program counter	A special register in the CPU that holds the address of the next instruction to be executed.
quantification	The changing of data to numbers or measurable quantities.
record	A collection of related data treated as a unit, such as the payroll information for one person.
register	Very fast memory locations found in the central processing unit.
repetition	Repeating programs steps a number of times as a "control" that makes programs shorter or easier to write.
routine	A self-contained set of instructions used by a program.
secondary storage devices	Supplementary, external data storage or memory, such as magnetic tape or disks.
second-generation computers	Computers that use transistors, capacitors, and resistors instead of vacuum tubes or integrated circuits. The IBM 7090 is a second-generation computer.
sequential file	A file of information that can only be read record by record, starting from the beginning of the file. To reach a certain record, the computer must first go through all of the other records in front of that one.
simulation	In computer technology, the development of a model for the purpose of testing a theory.
software	Storage devices containing computer programs. For example, games, educational programs, or word processing programs.
software houses	Companies that specialize in creating and selling computer programs.
solid state device	An electrical part that works by the flow of electrons in solids; for example, a transistor or a bubble memory.
stored programs	Instructions that tell the computer how to process data. These are stored like data in the computer.

subroutine	A self-contained set of instructions within a routine or another subroutine.
supervisory program	A computer program that controls the execution of other computer programs and controls the flow of work in a data processing system. Part of the operating system.
syntax error	An error caused by a mistake in the way a command or information is given to the computer. Each programming language has its own structure which must be followed. If the structure is not followed, the programmer has made a syntax error.
system	A collection of people, machines, and methods organized to meet certain goals.
systems analysis	Procedures for the systematic study of the structure of a system to improve it. A study of the relationship of the purpose of parts to the system's goals. Also, a procedure for designing new systems.
systems analyst	One who studies a system and suggests ways to improve that system.
systems programmer	One who creates operating systems and languages for computers.
tabulate	To arrange in a table; to condense and list.
tape drive	A device similar to an audio tape recorder that records and plays magnetic tape; used to record and store computer programs and data.
technical representative	A person who knows about computers and about a certain field, such as manufacturing or medicine, and can help a customer select the best computer for his or her purpose.
terminal	A device, usually equipped with a keyboard and some kind of display, that can send information to and receive information from a computer.
time-sharing	Use of a computer by more than one person at the same time.
transistor	A small semi-conducting device that performs the functions of a vacuum tube in a circuit. Among other things, it can serve as a switch or a memory device.
third-generation computers	Computers that use integrated circuits or silicon chips. Most minicomputers and all microcomputers are third-generation computers.
unambiguous	Straightforward, can be interpreted in only one way.

vacuum tube	A sealed tube (used in electronics) which contains metallic electrodes but almost no air or gas.
variable	A part of a program that is changeable or may have a number of values.
video terminal	A terminal with a television-like screen for showing information.
word	A unit of data storage noted in terms of either bits or bytes; varies in length from one model of computer to another.
word processor	An office computer used to manipulate words or written material rather than numbers.

APPENDIX 12
For More Help ...

The Office of Technology maintains a Technical Assistance Center (TAC) in each of the five boroughs. These centers are equipped with a wide variety of computers, software, and, most important, experienced advisors to help you use the computers in your school more effectively and to answer any questions computer education you may have. All New York City Public School teachers are welcome to make use of TAC facilities, either by telephone or in person, at any time during the year. TACs are normally open from 9 A.M. to 5 P.M. during the school year and through all school vacations, including the summer, but daily hours can vary. Call first.

Bronx TAC
1000 Teller Avenue
Bronx, N.Y. 10456
(212) 588-0279

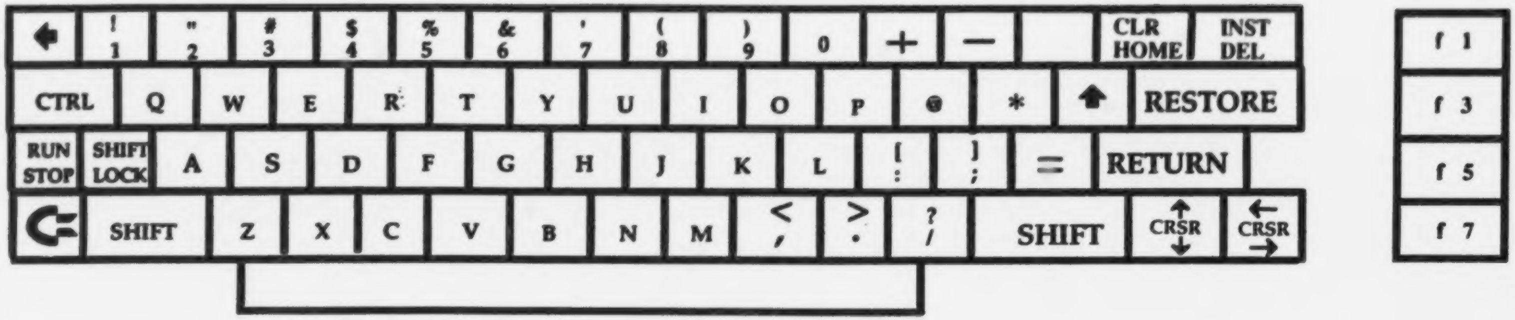
Brooklyn TAC
131 Livingston Street
Brooklyn, N.Y. 11201
(718) 596-5195

Manhattan TAC
134 West 122 Street
New York, N.Y. 10027
(212) 662-0122

Queens TAC
167-01 Gothic Drive
Jamaica, N.Y. 11432
(718) 658-0491

Staten Island TAC
1200 Manor Road
Staten Island, N.Y. 10314
(718) 494-5042

COMMODORE 64 KEYBOARD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1
"
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0
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CLR
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RESTORE
f 3
RUN
STOP
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LOCK
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RETURN
f 5
SHIFT
Z
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C
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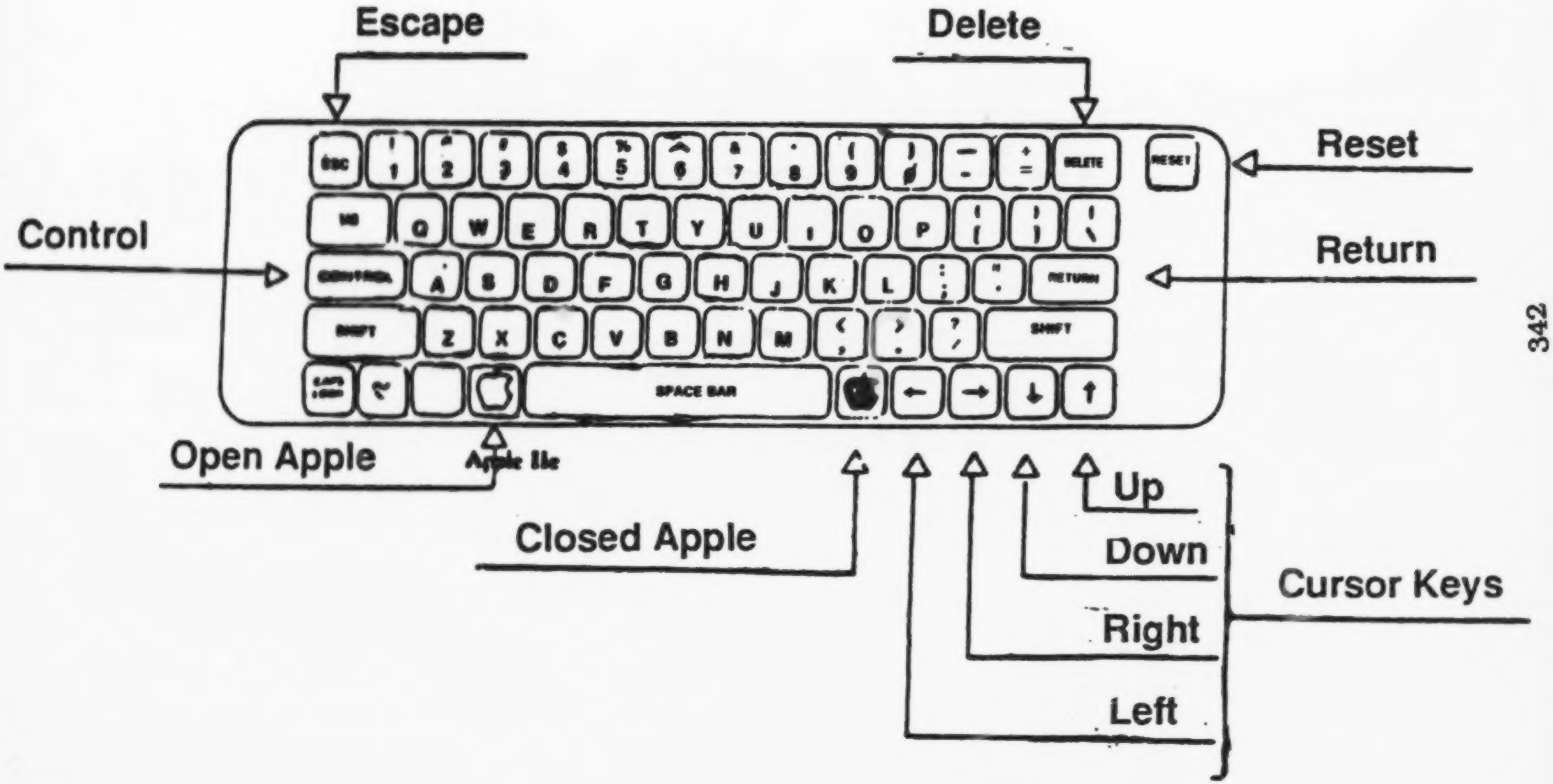
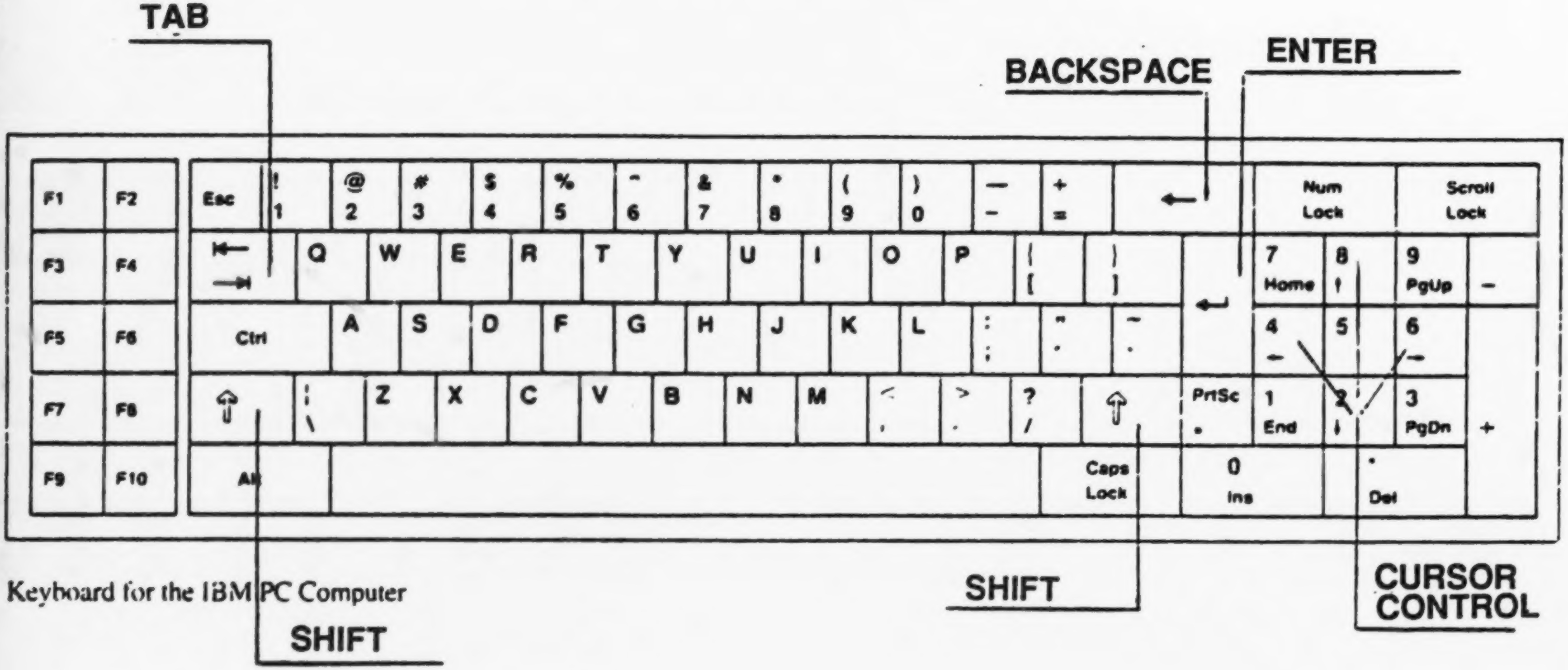
SHIFT
CRSR
CRSR
f 7

APPLE IIe KEYBOARD

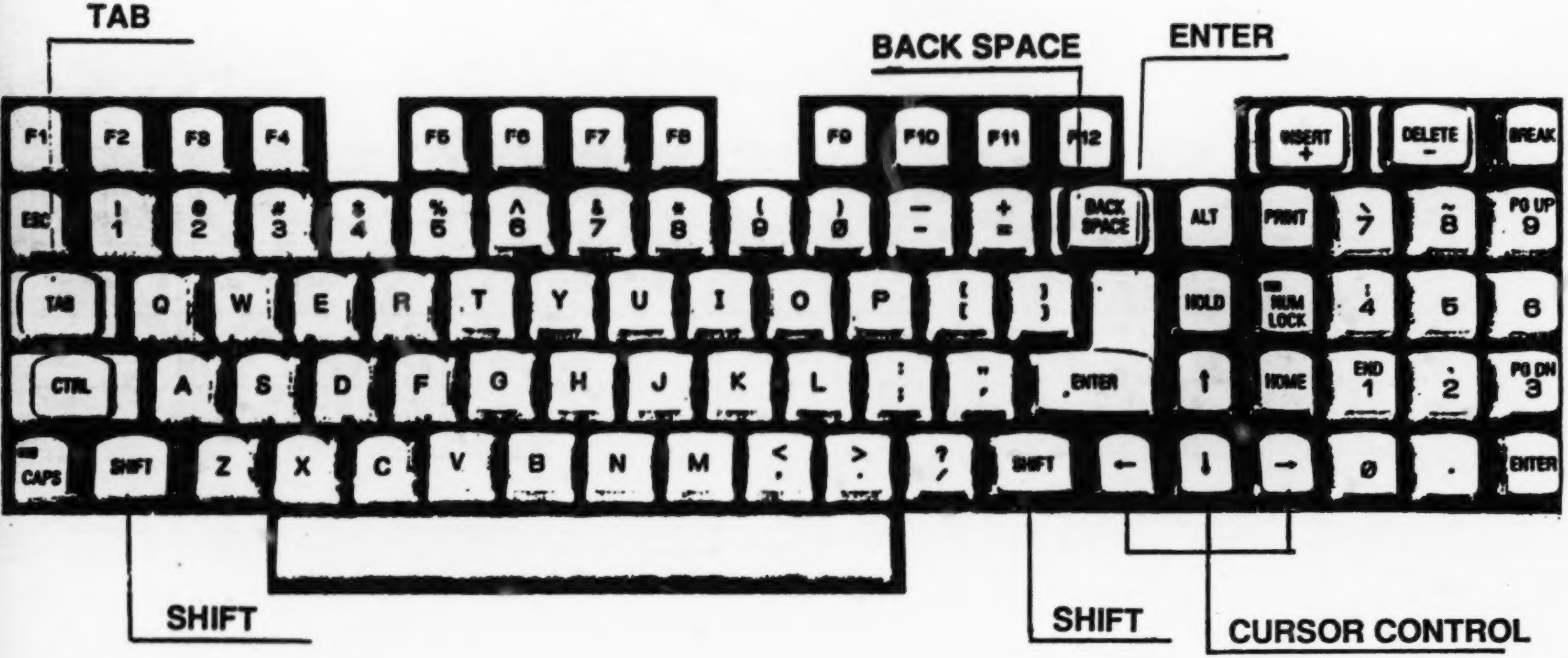

Escape
Delete
Reset
Control
Return
ESC
DELETE
RESET
CONTROL
RETURN
SHIFT
SHIFT
SPACE BAR
Open Apple
Apple IIe
Closed Apple
Up
Down
Right
Left
Cursor Keys

IBM PC KEYBOARD


TAB
BACKSPACE
ENTER
SHIFT
SHIFT
CURSOR CONTROL
F1
F2
F3
F4
F5
F6
F7
F8
F9
F10
Esc
Ctrl
Alt
Caps Lock
PrtSc
Num Lock
Scroll Lock
Home
PgUp
End
PgDn
Ins
Del

Keyboard for the IBM PC Computer

TANDY 1000 KEYBOARD


TAB
BACK SPACE
ENTER
SHIFT
SHIFT
CURSOR CONTROL